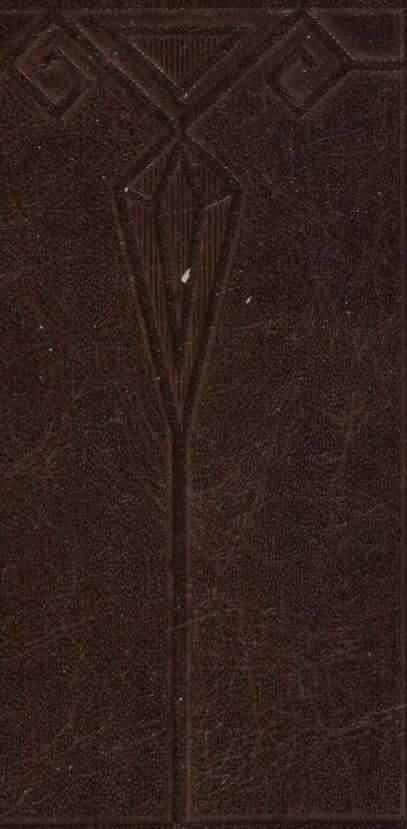
BUSINESS EFFICIENCY



RAILWAY TRANSPORTATION

SOME PHASES OF ITS HISTORY, OPERATION AND REGULATION

BY

FRANK L. McVEY, PH. D.

COLUMBIA INSTITUTE
CHICAGO

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PREFACE

This book is presented as a guide to the study of some of the problems of railroads. It cannot, in the very nature of things, be more than an outline, since the field is so large, but it is hoped it may open to the mind of the reader and student the vastness of the railroad organization and the difficulty of the problems which confront it. The discussion is limited largely to American practice, though illustrated by occasional recital of European experiences.

A summary of the provisions of the Transportation Act, 1920, enacted for the regulation of the railroads after the period of emergent Federal control consequent on the World War, will be found in Part IV of this volume.

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RAILWAY TRANSPORTATION

INTRODUCTION

Sec. 1. Transportation and Expansion

The key to American history is found in the story of a people making their way across a vast continent, subduing nature, developing industries, and building cities. As the conquest proceeded, and the population moved westward, new frontiers were established from time to time, marking, like lines on the sands of the sea, the progress of the people. From these frontiers sprang others, a little farther toward the West, where was created again the same type of social organization as existed in the settlements left behind. Thus social development was continually beginning over again on each new frontier.

Left alone, with no social and economic connections, the country would have been a collection of isolated towns, hamlets and countrysides. The very fact that from one frontier another grew made association inevitable and necessary. The connecting link between these outposts of civilization at first was the means of communication afforded by path, roadway and river; as the art of moving goods developed, and new means of transportation were utilized, the frontier passed out of existence from a fringe of hamlets into an area of settled territory. As a conse-

quence of this movement, the market previously afforded in a limited territory was enlarged, and raw materials were brought from wider and wider areas, with a resultant increase in the distribution of the finished product, and an immense growth in the industry and productive power of the people. Compared with these early days, the method of empire building has changed, and the pioneer goes now by railroad, which does not even follow the migration movement. "Long before he has discovered 'the chance' in unsettled areas, hastily built branch lines reach like fingers over the untilled plain. Towns are laid out at intervals as regular as the squares of a chessboard. In a week stores, a bank, and a lumber yard; in a month the homeseekers' train with its load of new residents, who will buy and improve the territory for miles around."

Sec. 2. Influence of Transportation

The effects of railroad construction are far-reaching. Because of the lowered cost of moving goods people have moved from the primary places, where extraction of raw materials went on, to the secondary production places. The natural advantages of localities have decreased in importance thereby, and through the development of transportation the organization and equipment side of production has been materially strengthened. The whole tendency in consequence has been to shift the processes of production, except in the earliest stages of the preparation of raw materials, from the location of the resources to the market.

Both internal and external trade have been encouraged by this movement, the one by the larger opportunity for securing raw materials and the other by the furnishing of an outlet for the manufactured products. But transportation facilities influence demand also by extending the field of the market and opening the way to new consumers. In the smaller cities the merchant may now decrease his stock, because he can rely upon transporting facilities to bring the goods from the great warehouses in the neighboring large city; he becomes by this method of business an agent of the larger concern and an outlying station for the great city. Many goods which thus might have been lost to society are rescued and brought to the selling place, where they are disposed of in meeting the varied wants of a people.

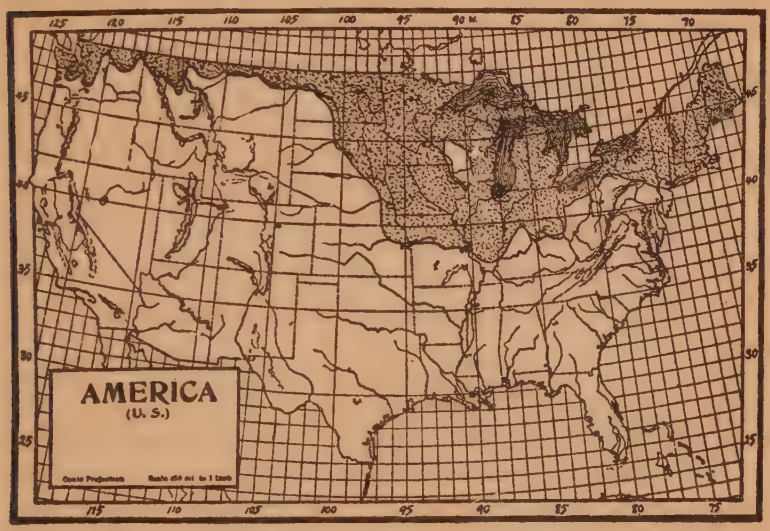
In the movement of goods a break may occur on account of the shift from one form of transportation to another or because of a change in the ownership of the goods. The first may be observed in the interruption in traffic where land and water transportation meet, as in the instance of a change from canal to railroad, from sea-going vessels to lighter craft, from railroad or canal to ocean steamer. At points where such breaks in cargo occur there soon gathers a population busily engaged in the transfer of the goods and ownership; as the business grows, storage docks, switchyards, elevators, warehouses and specialized groups of labor become necessary. Around about these soon appear other groups of workers and secondary forms of production are established for the purpose of furnishing many of the supplies required to support the enlarged population. The great

commercial city is the result, however, not only of a break in transportation, but also of a change in ownership such as is found in a seaport town where imports change hands and exports are turned over to foreign merchants. At the point of interruption in transportation there must be added to the facilities required in the smaller town the personnel of commercial houses, brokerage and commission firms, bankers, lawyers and underwriters to create the great commercial center. As the perfecting of transportation goes on through invention and concentration of management, the tendency is to eliminate the breaks in the movement of goods, limiting thereby the importance of smaller cities and magnifying and increasing those where the interruption in the movement of goods is accompanied by a change in ownership.

Sec. 3. The Importance of the Railroad

Both in England and the United States, and to a somewhat lesser degree in Germany, the most important factor in the movement of goods is the railway. The same instrument of commerce is at once the most typical expression of national industrial organization and the best organized phase of modern industry, a feature that may be accounted for in some degree by the pressing demands for transportation facilities and the early monopolization on the part of the railway companies of the canals and waterways. In Germany the canal is a well-recognized factor in the traffic situation, and as such has done much for the shipper, a condition that has not existed

in England and the United States.* The railroad has therefore come to be pre-eminent as a transportation factor in these two countries. In Europe the railway has followed trade, in America it has preceded commerce; this has been due in part to the land grant system and extensive encouragement given to its construction and operation, but more particularly to the profit likely to arise from the construction and operation of new railroads and the sale of goods in the larger market created thereby.



The Area of Glacial Soil

Sec. 4. The Basis of Railway Development

In America the basis of the railway's development in the last thirty-five years has been the presence of remarkable natural resources in the center of the continent. These resources are found in the fer-

* Letz, Verkehrsentwicklung in Deutschland, 1800-1900, pp. 94-107.

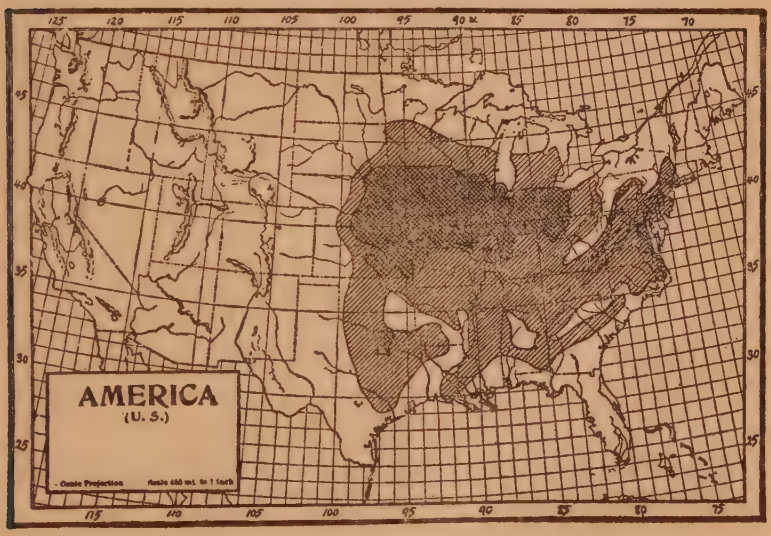
tile lands of the Ohio and the Mississippi Valleys, where wheat, corn, oats and other cereals are grown in vast quantities. Here, too, are to be found the sources of the animal foods of the nation; and, underground, the minerals and fuels for industrial purposes. An examination of the maps found below will emphasize the importance of this statement.* In the area of the states of

The American Coal Fields

Pennsylvania, Ohio, Indiana, Illinois, Missouri, Iowa, Minnesota, Wisconsin and Michigan is located most of the coal and iron which the nation possesses, as well as the largest areas devoted to the feeding of cattle and the production of wheat, corn, oats, and other cereals. The topographical conditions, added to the presence of these vast

*The diagrams shown in this chapter are taken from the report of Professor J. Paul Goode to the Chicago Harbor Commission.

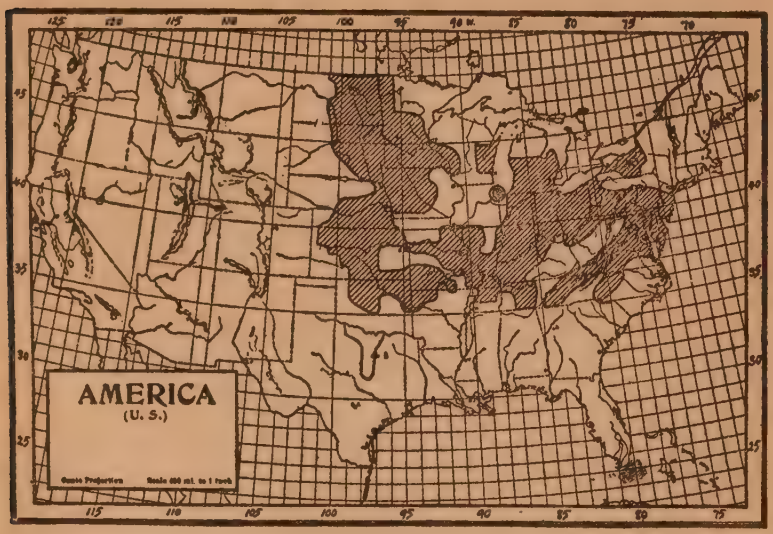
resources, have stimulated the development of railroads in a very remarkable degree. The obstacles which nature has offered in the way of mountain ranges, rivers, and rough lands are limited, with the result that the building of railroads in these states has been a matter of comparatively small expense. In its endeavor to reach these resources it has reclaimed many not touched by previously existing systems of transportation. The roadway, and even the canal, were limited in the territory which they could actually accommodate in the movement of goods; the



The Corn Producing Area

railroad was able not only to save in the cost of moving goods in the territory already touched by roadway and canal, but it very materially extended the limits of the area covered by the old means of transportation. The development of railroads

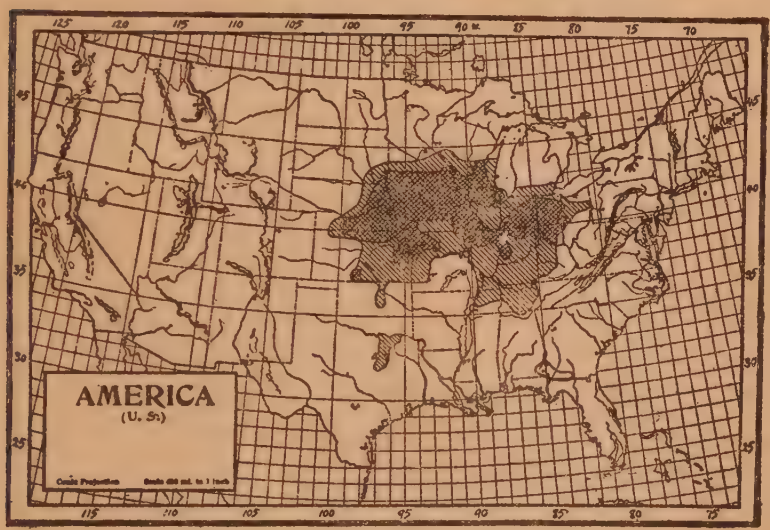
in America, where military roads have been unknown, can be explained in practically every instance by the fact that a profit is to be found in the movement of goods. This profit may not necessarily be one which comes from the direct operation of the railroad, but it may arise from the increased sale of commodities in a larger territory. The limiting of the merchant's territory through inadequate means of transportation necessarily cut down the sale of the product that he was attempting to dispose of, and in addition increased the expense of actually putting it in the hands of the consumer.



Chief Wheat Producing Area

In the historical development of the continent it may be said that lowered cost of transportation has figured largely. It was found that long hauls reduced the cost per mile on the commodities transported, and where this could be accomplished at a

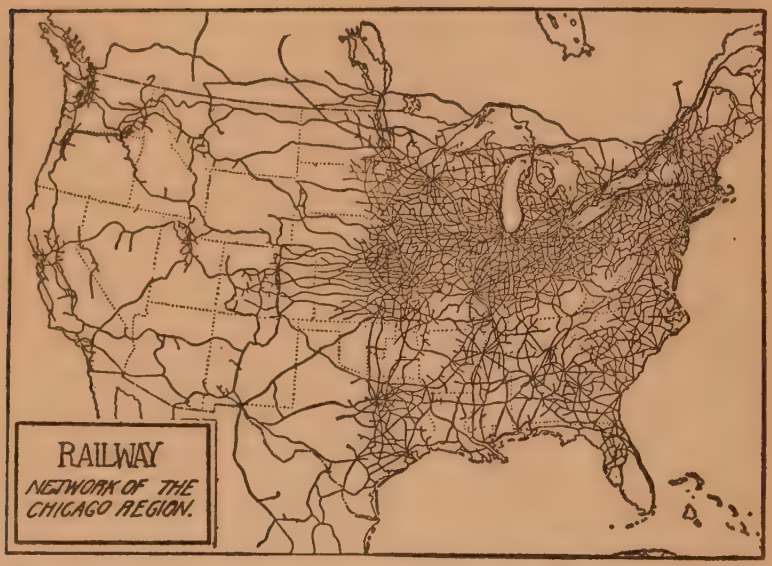
uniform expense, as in the instance of the railroad, there was a saving in time as well as in the cost of moving the goods. As a result of this development markets were brought into existence where none before had existed, and goods which previously had no vent were now put into the hands of consumers who were willing to pay for them. As an example of this



Area of Maximum Swine Production

statement a situation before the coming of the railroads may be cited. In one of the valleys of the Montana mountains a magnificent crop of wheat was raised by one of the early settlers, but he could not get it to the market except by pack horse; the coming of the railroad gave him access to a market, and created as well a town nearby where he could sell butter and eggs. The extension of the margin of profitable industry was constantly going on through the extension and building of railways.

One of the factors in the development of railroads has been the rivalry of trade centers struggling with each other for the supremacy in a given territory. As merchants came to realize the fact that their markets could be materially extended by the use of the railroad, groups of them here and there, in the cities along the Atlantic coast at first, and in the



Map Showing Concentration of Railways in Ohio and Mississippi Valleys

Mississippi valley afterwards, began to organize companies for the purpose of securing outlets into the new territory. An example of this is seen in the contest between Baltimore and Philadelphia in their efforts to secure for themselves the Ohio trade. In the same way New York, Boston and Philadelphia struggled for the trade that had for many years been considered the special possession of New York because of the existence of the Erie canal; the final dis-

position of it was determined by their control over the railroads leading to the different cities. In the Middle West, Cincinnati, recognizing the benefits of the trade south of the Ohio, built the Cincinnati Southern, and Buffalo struggled to maintain for herself the control of the trade of the Great Lakes. But in Chicago was found a center towards which the products of the Mississippi valley moved, because of its presence in the midst of the many resources of nature found in the states mentioned above. As the Northwest developed, the Twin Cities appeared as an increasing factor in the distribution of commodities and in the development of railroads. In the Southwest the same is true of cities like St. Louis and Kansas City, that have been built up because of their position in relation to railroad sytems.

Without question the nature of the freight which has been moved in America has forced the development of the very best equipment, seen in bridges, locomotives, rails, and cars. As already shown, the products of nature were the fundamental freights that were moved upon the railway. But these, while valuable, were great in bulk, requiring first-class equipment to move them. If a summary might be made of the forces working in the development of transportation in America, one would say that they are, first, the movement of the population across the continent, constantly seeking new territory in which to develop the resources of nature; second, the existence of the vast area known as the Mississippi valley, which lends itself in resources and topography to the development of trade and industry in an unusual degree; third, the constant struggle on the part of

cities for control over the movement of freight in territories adjacent to them, and, fourth, the nature of the freight which was shipped from point to point in the manufacture and production of commodities.

Sec. 5. The Growth in Figures

All of this development is well measured in the figures for the year 1918, as reported by the Interstate Commerce Commission. According to that report, the number of miles of railroad operated in the United States was 266,031. Eleven states had within their borders 105,547.34 miles of this total. Taken as a whole, there were in the United States twenty-seven miles of railroad for each 10,000 inhabitants, and for each 100 square miles of territory seven and three-fourths miles of railroad. As compared with Europe, on the same basis this was more than five times the length of railroad on that continent.

SUMMARY OF RAILWAY MILEAGE OWNED IN THE UNITED STATES BY STATES AND TERRITORIES.*

State or Territory.	Mileage on June 30, 1918 — Official. miles.	Unofficial. miles.	Total miles.	Prop. to total mileage, percent.	No. miles of line per 100 sq. m. of territory.	No. miles of line per 10,000 inhabitants.
Alabama	4,860.62	177.00	5,037.62	2.19	9.77	24.60
Arkansas	4,860.85	22.50	4,883.35	2.12	9.21	33.24
California	6,663.71	171.89	6,835.60	2.97	4.38	41.09
Colorado	5,295.13	.30	5,295.43	2.30	5.11	87.63
Connecticut	1,015.61	....	1,015.61	.44	20.96	9.98
Delaware	335.98	....	335.98	.15	17.14	16.26
Florida	3,970.49	40.33	4,010.82	1.74	7.39	67.73
Georgia	6,786.33	82.50	6,868.83	2.99	11.65	27.67

* Statistics of Railways in the United States, Report of Interstate Commerce Commission

Idaho	1,731.16	32.54	1,763.70	.77	2.09	97.50
Illinois	12,137.10	68.93	12,206.03	5.31	21.80	22.61
Indiana	7,252.32	9.50	7,268.82	3.16	20.24	25.80
Iowa	9,867.00	44.53	9,911.53	4.31	17.87	29.66
Kansas	8,935.54	5.50	8,941.04	3.89	10.94	54.32
Kentucky	3,441.19	42.95	3,484.14	1.52	8.71	14.49
Louisiana	4,557.70	180.20	4,737.90	2.06	10.43	30.62
Maine	2,093.46	57.46	2,150.92	.94	7.19	27.67
Maryland	1,431.94	36.88	1,468.82	.64	14.90	11.04
Massachusetts	2,111.78	15.17	2,126.95	.92	26.45	6.77
Michigan	8,940.71	35.58	8,976.29	3.90	15.63	33.11
Minnesota	8,246.38	39.50	8,285.88	3.60	10.46	42.26
Mississippi	4,081.11	88.00	4,169.11	1.81	9.00	24.00
Missouri	8,038.52	63.43	8,101.95	3.52	11.79	23.29
Montana	3,307.27	.....	3,307.27	1.44	2.28	212.41
Nebraska	5,931.61	33.10	5,964.71	2.59	7.76	49.97
Nevada	1,699.68	.....	1,699.68	.74	1.55	355.58
New Hampshire	1,248.30	.....	1,248.30	.54	13.86	27.10
New Jersey	2,250.21	51.85	2,302.06	1.00	30.59	10.91
New York	8,471.89	32.86	8,504.75	3.70	17.86	10.45
North Carolina	4,384.87	91.50	4,476.37	1.95	9.21	21.11
North Dakota	3,905.57	.....	3,905.57	1.70	5.56	109.28
Ohio	9,260.60	13.85	9,274.45	4.03	22.75	19.92
Oregon	1,938.92	17.00	1,955.92	.85	2.07	42.27
Pennsylvania	11,258.66	99.11	11,357.77	4.94	25.25	16.10
Rhode Island	208.39	3.40	211.79	.09	20.11	4.42
South Carolina	3,370.91	53.50	3,324.41	1.45	11.02	22.16
South Dakota	3,702.79	.....	3,702.79	1.61	4.82	82.32
Tennessee	3,725.27	35.50	3,760.77	1.64	9.01	16.62
Texas	12,931.85	55.96	12,987.81	5.65	4.95	38.05
Utah	1,956.59	29.50	1,986.09	.86	2.42	64.17
Vermont	1,071.47	22.76	1,094.33	.48	11.98	28.45
Virginia	4,055.66	131.14	4,186.80	1.82	10.43	20.17
Washington	3,766.82	39.80	3,806.62	1.66	5.69	65.63
West Virginia	3,264.02	91.42	3,355.44	1.46	13.62	31.26
Wisconsin	7,459.08	167.80	7,626.89	3.32	14.01	32.92
Wyoming	1,525.59	.....	1,525.59	.66	1.56	147.40
Alaska	.....	.....	.....	.....	.....	.....
Arizona	1,928.48	2.50	1,930.98	.84	1.71	140.43
Dist. of Columbia	31.32	.80	32.12	.01	53.53	1.03
Hawaii	.....	.....	.....	.....	.....	.....
Indian Territory	2,667.05	90.30	2,757.35	1.20	8.89	62.75
New Mexico	2,965.02	2.00	2,967.02	1.29	2.42	135.48
Oklahoma	2,821.32	.....	2,821.32	1.23	7.26	63.30
United States, 1918	263,750.66	2,280.34	266,031.00	100.00	7.74	27.02

The revenue received from all sources amounted to $4,913,319,604, of which more than 68 per cent, or $3,450,000,000, was the revenue from the movement of freight. The capitalization of railroads in the United States amounted to more than $16,000,000,000, of which $7,356,000,000 were in the form of common and preferred stock, and $8,725,000,000 in funded debt. Of the stock, 67.27 per cent paid dividends of $308,088,627. The enumeration of the vastness of the transportation interests in the United States can be further illustrated by the fact that 875,000,000 different passengers, in round numbers, were carried in a recent year. Reduced to a mileage basis the number carried was more than 27,000,000,000. The number of tons of freight carried was 1,796,000,000, which reduced to a mileage basis amounted to more than 236,000,000,000 tons carried one mile. The average journey for each passenger was 32 miles, and the average haul of each ton of freight was 132 miles. The freight cars at work upon different systems made a total mileage of more than 17,000,000,000. More than a million seven hundred thousand men were employed in the operation of the roads of the country. Using the proportion of one to five, it can be said that upwards of 8,500,000 persons were dependent upon the railroad industry for their support.

Sec. 6. Summary of Effects

These figures, immense as they are, give only a passing glimpse of what is being done by the railroads of the United States and the intricacies of

their management and organization. They apply only to the growth of the railroads themselves, and cannot show the resultant improvement in production that has followed the evolution of the railway. Through the facilities it offers, the railway has brought about: (1) localization of industry has been effected whenever economically possible, with a resultant emphasis on the economies of place, such as is evidenced in the fruit growing of California; (2) immigration and emigration have been facilitated, through which labor has been distributed where it can be utilized; (3) production has been able to draw upon wider areas for its materials and to sell its products at greater distances from manufacturing centers; (4) population has been assisted both in its centralizing as well as its distributing, with great social results; (5) communities have come into closer contact with others and a great social amalgamation has been materially advanced; (6) an immense body of workers have found employment through its agency. The railway is not merely bands of steel over which cars move; it is a social agency touching the nation at many points.

Sec. 7. The Railroad Defined

Railway transportation differs materially from other forms of business, in that it requires a large permanent investment for a narrowly defined purpose which once invested must remain. Locomotives are always locomotives, and when worn out they find their way to the scrap-heap. If unhappily the business of railway operation does not pay, the owners

cannot contract their capital, for it is in a form that can be used for one purpose only, that of transportation. On the other hand, the railroad has a monopoly, the character and extent of which depends upon the territory, the resources of the country and the population. The stages of civilization, too, determine the kind of transportation that will be provided and the amount of capital that will go into rails and equipment. The development and operation of the railway are more potent than its construction. They are thoroughly tested in the cheap handling of freight and passengers, and on account of this accomplishment the railway has grown from an incidental to a principal element in the life of society.

The railroad as a machine consists of (1) a right of way, on which are tracks and telegraph; (2) terminal facilities, where cars are stored, loaded and unloaded; (3) locomotives; (4) cars. As an organization it is a great human force united under a board of directors, through whom emanates authority, which is divided among many men as it passes down the long line of officers and employes; and it comes in contact with the public as a carrier of freight and passengers, and as a taxpayer. To present a general study of the railway as a machine, as an organization, and as a public servant is the object of this book.

PART I

THE GROWTH OF RAILROADS SINCE 1825

CHAPTER I

THE EARLY PERIOD OF RAILROAD BUILDING

Sec. 8. The Contribution of America

In no country does railroad history show so many phases as in America. The short line, consolidated roads, private ownership, municipal and state ownership, state control, and federal regulation have all had their day. On the side of the mechanical appliances, rails, and bridges, and of internal management, the changes have been quite as great. These have been brought about through private initiative, stimulated by competition and compelled by legislation. The result of all this is, that the railway is a marvel of mechanical ingenuity, engineering skill, and masterful organization.

"The science of transportation is going to be the special contribution of the American people to political economy. It is the most interesting feature in their economic system, and the achievements which they have accomplished through it will in future ages read almost like fables. It has been a magician's wand, calling towns into existence on the desolate prairies, raising towns into cities, and cities into world-famous hives of wealth and industry. It

has conjured up fortune out of nothing, and multiplied values ten, twenty, aye, often an hundred fold. Millions of well-paid, well-fed laborers enjoy its blessings without ever thinking to what they owe them. For every capitalist, every large manufacturer, every prosperous merchant that there could have been without it, there are now thousands. The teeming factories of New England and the mammoth warehouses of Chicago have sprung from it as directly as the silver mines of Colorado or Nevada. The wealth-creating power of North America is to a large extent the product of its wealth-distributing facilities. But for the capacity of the railways to carry wheat from the Missouri river to the Atlantic coast for a few cents per bushel, there would have been no wheat farms west of Chicago, and many of the richest agricultural states in the Union might still have been in the possession of the buffalo and the red Indian." *

Sec. 9. Periods of Its History

Ninety years of history were required to reach this culmination, and in that time three distinct periods in the growth of the railroad are clearly outlined. The first of these is known as the early or experimental period, in which many kinds of locomotives, rails and cars were tried. The second was the middle period, when the trunk lines were developed, and the third the period of consolidation, when vast systems were organized. In years the first period is marked by 1825 to 1850, the second 1850 to 1890, and the third 1890 to the present time.

* The London Financial Times.

Going back to the first period, which is the subject of this chapter, we find that the railroad was the outcome of several attempts at the solving of transportation difficulties. These attempts mark history just as do the periods in the development of the railroad. From the trail and the path to the turnpike is a distinct step. From that to the river and the canal means a cutting of time and expense in moving goods, and from the river and canal was a further step which led finally to a demonstration of the superior powers of the railroad as a carrier.

Sec. 10. The Turnpike and the Canal

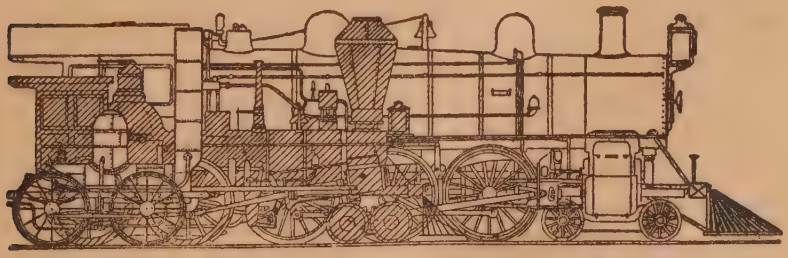
The first turnpike built in America was in the year 1790, and by its agency it was possible to carry commodities on wagons one hundred miles for ten dollars per ton. This advance over the old way of transportation by ponies and packs led the federal government to spend $4,300,000 on the National Pike, which was finally completed in 1838. Mr. Gallatin, Secretary of the Treasury, was so impressed with the necessity for a scheme of roadways that he proposed the expenditure of twenty millions of dollars; but constitutional doubts regarding the right of the federal government to extend aid for internal improvements brought the scheme to an end.

While this development was going on the steamboat had been invented and was actually in use on the Ohio river as early as 1811. Several decades before this date flatboats had been used in transporting goods down the Ohio and up the tributary streams. Canals had been projected during the last

fifteen years of the eighteenth century and one or two were built before the close of the century, the object being to connect waterways through their use. The building era of canal construction dates about 1812. The great example of canal construction is the Erie Canal, which was completed in 1825. As a result of its construction the cost of transporting a ton of goods from Buffalo to New York was reduced from $100 to $25, and, what was quite as important, there was a reduction in time from twenty to eight days. The Erie Canal gave to the city of New York a great impetus in the development of her trade. Through its agency it was possible to touch the Northwest, which was rapidly developing at the time. This and other examples stirred the states into a great movement of internal improvements, and these improvements in the building of roadways and canals, the organization of banks, and even the development of railways carried the states into great debt, which by the year 1838 had reached the large sum of $170,806,187. This debt, great for those days, had been incurred to the extent of $52,640,000 in the establishment of banks, $60,201,000 for the building of canals, $42,871,084 for the building of railroads, $6,618,868 for the building of roads, and $8,474,684 for miscellaneous matters. The year 1837, however, with the panic that came at the time, brought an end to state aid, and the works that had been created with such anticipation on the part of the states were sold by them to private corporations.

Sec. 11. Internal Improvements

As a result of these internal improvements the canal was well established when the railroad came to be an actual force in transportation. The building of the Erie Canal fanned the canal idea into a real flame of enthusiasm, and more than 5,000 miles were built, at a cost of $150,000,000. Such development, however, is not understood until the economic history of the Middle West is brought, at least in outline, to the attention of the reader. The great population had moved into the Ohio Valley and the lands of that section were rapidly being freed from Indian title. The whole policy of congress was to open up lands to settlement as rapidly as possible, and the movement of population westward created demands for transportation that were unusually insistent. The waterways of the country flowed southward, and the canals, with the exception of the Erie and the Chesapeake and Ohio, were built invariably in the same direction. The result was that what was needed was some means of communication that would connect the East with the West. The country was divided into three great districts,



The DeWitt Clinton, the Locomotive of 1850, and the Production of 1900, from The Scientific American.

the East, the South and the West, and their connection with each other was comparatively limited, due to the absence of any system of transportation that would bring them together. The development of the railroad, therefore, came at an opportune time, not only economically, but politically. Economically it came in anticipation of the demand that had arisen for the movement of goods east and west, and politically it brought about a closer amalgamation of the different sections of the country and prevented what might have resulted if they had continued separate a number of years longer, namely, a distinct development of three national states.

Sec. 12. Early Railroads

Many experiments had been made with railroads. As early as the sixteenth century rails had been laid on timbers for the movement of coal at the collieries near Newcastle-on-Tyne in England, and over these cars were moved by horsepower. The next step in the improvement of this crude railway was the fastening of the rails to cross ties. By 1735 flat iron bars were substituted for the wooden strip, and by 1767 cast iron bars were generally substituted for the entire wooden rails. But it remained for William Jessop, in 1789, to develop a new form of cast iron rail, in which the depth was greater than the width. By various improvements the T-rail was finally created, new methods of fastening it to the ties were discovered, and the railroad began to take its modern form. The great advance of the wrought iron edge rail over the older forms gave the first great impetus to the

development of a means of motive power for railroads other than horses, and the possibility of using steam locomotives was suggested as a consequence. Many attempts had been made to build steam carriages for operation on the common roads, but these locomotives were not satisfactory. They were limited in haulage power, in speed, and showed high cost of operation. It remained for George Stephenson to build a locomotive that could haul a load of thirty-five tons at the rate of four miles per hour, on a grade of one foot in 450.

In railroad history the Rainhill contest of 1829 is one of the picturesque incidents to which many references have been made. The directors of the Liverpool and Manchester road, desiring to secure the best locomotive of the day, offered a prize of $500. The result of the contest was the awarding of the prize to Stephenson's locomotive, the "Rocket." Its performance on that occasion was small as compared with the work of locomotives of the present day, but it was in advance of the other types of road machines competing. So much had been done in the way of experiment, both in the matter of motive power and the construction of the roadbed, by 1830, that the railroad of that day might be regarded as having demonstrated its success. The principle of

Early form of rail; hardwood strips on wooden stringers, laid on cross ties.

Granite blocks stripped with iron.

Wooden stringers faced with iron, 1735.

Outside iron flange rail on wooden stringers, 1760

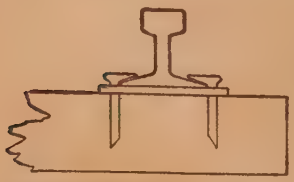
hauling by power on rails had been, through the various experiments, clearly worked out. The flange, which had previously been made in the rail, was changed from the rail to the wheel by 1815, so that all the fundamental principles of railroad construction were really developed by the year just referred to. It may be said further that the first third of the century, certainly to 1840, made the railroad a competitor of the canal; but serious competition on the part of the railroad with the canal did not take place until after that date.

Inside flange rail on wooden stringers, 1780.

Iron rails held in iron rests on granite blocks, 1825.

Like other innovations, the railroad was opposed by the various interests of the day. The farmers were hostile to it for many reasons, such as the possibility of scaring their flocks and animals as the trains passed. The tavern-keepers, whose inns had sprung up along the turnpikes, and who catered to the stage-coach public, were also opposed to it; the people generally were hostile and suspicious, and the great future of the railroad was in no sense realized. But the dividends which had been earned by the railroads built in New England, as well as the demonstration that the railroad was a better and less expensive carrier of goods than the canal, gradually changed pub-

Rolled iron rails on wooden ties, 1845.



T rail and fish plate on wooden ties. Rail invented by R. L. Stevens, 1830.

lic opinion, until scepticism was succeeded by a wild wave of speculation in all kinds of railroad enterprises. The cost of building railroads was more than was expected, and many losses resulted from the inability and inexperience of the men who were attempting to construct them. There was difference of opinion as to the proper gauge of the road, whether cars should be owned by individuals or by the railway companies, what type of tracks, and cars, and engines could be used to the best advantage, whether the principle of the turnpike should govern the passenger fares and rates upon freight, what should be the attitude of the legislature in the granting of charters and in the giving of bonuses,—all of these questions, and more, had to be fought out and determined as the years passed by.

Sec. 13. Short Line Railroads

The construction of railroads began with short lines radiating from the cities. Among the first of these was the Baltimore and Ohio, which was projected and financed by the merchants of Baltimore. They had had in mind the building of a canal connecting them with the Ohio, recognizing that if they did not secure transportation facilities with the West their city would be at a great disadvantage as compared with New York; but finding that they could not build a canal except at enormous expense, they seized upon the railroad as the best means of reaching their market. So rapidly was the road pushed that in 1834 it had reached Harper's Ferry.

In the state of Pennsylvania the railroad developed in a remarkable way. As early as 1835 two

hundred miles of railroad had been built in that State. The impetus to this building was due to the desire to secure fuel and to open up coal regions for markets along the seaboard. In this same State the commonwealth had undertaken in 1826 to construct various canals and railroads with the view of connecting Philadelphia and Pittsburg by a continuous line of internal improvements. To this end the Columbus and Philadelphia Railroad, 81 miles, and the Allegheny Portage Railroad, 41 miles, were built at a cost of six million dollars. These isolated railroads were connected by the Eastern and Juniatta divisions of the canal, which were 46 and 127 miles in length, respectively. The Portage Railroad was connected with Pittsburg by the western division of the canal, 104 miles, making a total length of 122 miles of railroad and 277 miles of canal, in all 399 miles, constructed at a cost of $14,361,000. These works were brought into use in 1830, though the railroad part was not completed until about 1833. The building of railroads and the methods employed are well illustrated in the examples cited in the case of Pennsylvania.

In Michigan, the Michigan Central Railroad, chartered in 1832, began the construction of a road to Detroit in 1836, but before completing any portion of the same the company sold their property and the franchise to the state in 1837. Under state construction the line was opened for business from Detroit to Ypsilanti February 23, 1838, and to Ann Arbor in 1839, and to Kalamazoo in 1846. In this year the legislature refused to make any further appropri-

ation, and the new Michigan Central Railroad purchased the property from the State in the same year.

In railroad history the Erie Railway stands out as a peculiarly unfortunate one. In its original purpose the road was chartered to secure for New York City the trade of the southern part of the state, which seemed likely to go to Boston and Philadelphia. It was constructed with bonuses from the state and local government. The charter contained a provision which prohibited the road, under penalty of forfeiture of its charter, from making any connection with other roads. But, if this had been desired, the gauge which had been adopted by the projectors of the road would have made it impossible to connect with other roads, which had adopted the English gauge of 4 feet 8½ inches. It was the first trunk line, about 500 miles long, extending from tide water to the lakes; but it did not reach New York city, there being a distance of twenty-four miles from the terminus of the road to the city, and the Erie was compelled, after trying every device of discriminating rates and increased speed, to capitulate to the Patterson and Hudson road.

An event of far-reaching importance was the use of the telegraph in the operation of trains. While practiced by individual conductors before 1851, it was by that time in general use, making it possible to save time and to materially increase the economy of moving trains from terminus to terminus.*

Sec. 14. Summary of Results

Thus, in the short period of fifteen years, railroad history had been complicated by many inter-

* See Railroad Gazette, XII, p. 88.

esting events. Locomotives had been improved, roadbeds greatly bettered, the iron bridges introduced, state construction tested, and private ownership tried in the operation of roads. Most of the roads were short, and their construction cheap. They were, in nearly every instance, subsidiary to water navigation. Because of the comparatively small amount of capital required to build the roads of the time, private means were able to cope with the state wherever it had gone into the building of railroads, and after the panic of 1837 the states withdrew more and more from active participation in railroad construction, confining their efforts to the granting of land and the payment of bonuses. The profits, too, were great enough in most instances to invite private capital, and the local interests of town and village were so aroused in many cases that the projectors of railroads found little difficulty in securing gifts of land and cash bonuses for the work that they were attempting to do. Two or three instances might be cited of long roads that were built to connect water navigation. The Boston and Albany was completed in 1842 and connected tide water with the Hudson river. In the same year a series of eleven roads joined the Hudson River with Lake Erie, and what is known as the Mad River Road, with its extension, connected Lake Erie with the Ohio River in 1848. Other instances, not so successful, might be cited of where short roads failed to perform the function that was expected of them, and were abandoned.

Sec. 15. Building of Railroad Mileage

According to the tenth census, there had been constructed in the United States by 1830, 39.8 miles of railroad; by 1835 the mileage reached 797.4; by 1840 2,755.18 miles of road had been built; by 1845, 4,610; and by 1850, 8,571 miles were in operation in the United States. By some authorities this figure has been placed at 9,021 for the mileage in the year 1850. By this date the railroad was well established in the industrial organization of the United States. The sentiment regarding its construction had materially changed from that of opposition to one highly favorable. More than that, the attitude of the state had been shifted from one for public construction by public funds to that of encouraging private enterprise to build and operate railroad properties. Charters were granted freely, with extended privileges and unusual rights. The state, in fact, had established a policy of railroad corporations with comparatively little restriction upon their activities. The canal, which had been such a factor in the movement of goods the first thirty years of the century, had lost its importance, and the railroad had demonstrated since that date its full ability to compete and to actually surpass the canal as a means of carriage.

The next decade showed a remarkable consolidation of the short scattered roads that had been built during the twenty-five years from 1825 to 1850, and with it came better management and better construction, foretelling in no uncertain way the rapid expansion of the railroad industry in the United States.

CHAPTER II

THE MIDDLE PERIOD OF RAILROAD HISTORY.

Sec. 16. The Character of the Period

The discovery of gold in California in 1848 was the forerunner of the rapid extension of railroad mileage. For seven years after this incident the average increase per annum amounted to 1,800 miles. With these events a new period in railroad history began. The formative and experimental period had passed, and a competitive one succeeded it. For forty years the competition of railroads with each other went on, with many resulting problems and difficulties, demanding legislation and stringent action. In this period long lines were built, land grants extended to the railroads by the federal government, pools organized, and public control tried as a means of curbing the exactions and demands of railway companies.

The period thus marked by the discovery of gold at its opening was closed by the passage of the Interstate Commerce Act and the Sherman Anti-Trust Act. The railroad had ceased to be local and was now national. The competition with the canals had been succeeded by contests between railroads for control over territory, rates and shipments. The long continental lines which became such important factors in the period after 1890 had not yet developed, and only such portions of them were con-

structed as joined one waterway with another. Thus the Erie Railroad extended from the Hudson River to Lake Erie by 1851. Cleveland and Cincinnati were bound together in the same year, Cleveland and Pittsburg the year following, and the Michigan Central and Michigan Southern brought the wares of the West from Chicago to Lake Erie and to Lake Huron, while the Rock Island connected Lake Michigan with the Mississippi River and diverted the traffic which had formerly passed down this stream to an eastward course over the railway.

Sec. 17. Connection of City Markets

A few years after these dates the idea of connecting great city markets supervened. The roads which had formerly been used to connect waterways were extended to the large cities. In consequence the importance of canal and river declined, and while here and there the canal struggled, either under state control or private operation, to maintain its place in competition with the railroad, nevertheless it was gradually superseded.

Meantime the railroads had pushed along the shores of rivers and lakes, coming into competition with the large craft upon these waterways. Thus the Hudson River and Lake Erie were flanked by railways extending along them. All of this building was accompanied by consolidation of the small roads. There had been eleven roads from New York to Buffalo, but these were consolidated in 1853 into the Hudson River and New York Central. Further west the Lake Shore and Michigan Southern had been formed by the union of several lines which had ex-

tended from Buffalo to Chicago. To this movement, which is merely exampled in the citations made, opposition appeared here and there, but the effect of it was to lessen the number of breaks in the transportation of freight. It very materially improved the administration, and it clearly cheapened the operation of the roads. All of the discussion which had taken place in the earlier period regarding the wisdom of the building of roads and canals by the United States government had passed away, and the emphasis upon state ownership and state operation had also ceased to exist, largely because of the unsatisfactory way in which the States had carried out their trust. The policy of corporate ownership, therefore, had been perpetuated and intensified, and with the marked attitude of the public toward a laissez faire policy and private ownership, the railroads were allowed to develop as they pleased, with little or no restriction. It was felt that competition could be trusted to break down any of the tendencies likely to originate in railroad operation which in themselves would militate against the successful movement of freight and the development of towns and villages. With this feeling prevailing in the minds of the men of the day, it seemed unnecessary to take any specific action regarding the making of charters or the regulation of rates. While the general government had refused to engage in internal improvements, soon after the constitutional question had been raised as to its right to do so, it had nevertheless established a policy of land grants to the western railroads. This policy was begun in the year 1850 in the case of the Illinois Cen-

tral and the Mobile and Chicago Railway. The federal government in this instance had granted to the State of Illinois two and a half million acres, and one million to the State of Mississippi. By 1880 the federal government had granted over sixty-six millions of acres to fourteen States, and this land was soon transferred to companies chartered for the purpose.

Sec. 18. Land Grants to Railroads

In these subsidies to the railways congress made in all seventy-nine grants, amounting to nearly 200,000,000 acres of public domain. This aggregate was subsequently reduced to 158,286,627 acres, of which more than 108,000,000 were actually patented. Towns and villages and county governments were anxious to aid in every way possible the development of railroads, and as early as 1870 they had voted $185,000,000 for the purpose of assisting the building of roads. Everywhere, especially in the Middle West, the people were crazy for railroads. Efforts were put forth to invite construction, and inducements made of almost a fabulous nature; individuals bought the stock liberally, towns gave rights-of-way, cities made over to the companies terminal grounds and granted them cash bonuses. While there was much jobbery connected with the development that took place under this great stimulus, nevertheless it can be said that the object hoped for was in a large measure attained. The state governments passed general corporation laws, under which a body of citizens might build a railroad whenever they could procure the right-of-way, and long before the close of the year, 1870, railroads had been built with a reck-

less prodigality that brought the result of increased competition and rate-cutting.

Referring back to the figures of 1850, it was found in that year that 8,571 miles of road had been built. These increased to 28,919 miles in 1860, and had reached the remarkable number of 49,168 miles in the year 1870. While the mileage was thus increasing, the managers of the roads had made considerable advancement in the building of cars and in the amount of the train-load. Three hundred and sixty tons were regarded as a train-load. The cars in such a train weighed 180 tons and the load the same amount. The locomotive weighed 55 tons. These figures compared with those of the present day are ridiculously small, but they were markedly in advance of the small locomotives and cars of the previous decade. Before the period was at an end (1890) the locomotive had reached the 100-ton mark, the Pullman car was well developed, the vestibule brought into use, the air-brake perfected and applied to freight as well as passenger trains, and the automatic coupler introduced generally.

Sec. 19. The Formation of Systems

The land grant policy of the nation had done its work. Foreign and eastern capital became interested. Bond issues were made possible under enticing credit methods, and the roads were gradually extended from the Mississippi, across the great plains, to the Pacific Coast. In the 70's great systems were formed, like that of the Vanderbilt, the Chicago, Milwaukee & St. Paul, the Northwestern, and the Plant systems. These organizations had

been created by the purchase of short railway lines, by the lease of others, and by the construction of roads that filled in the gaps. The old policy of building roads to connect water routes had been entirely given over, and even the collecting and distributing of commodities for the market were not altogether the purposes for which this rapid expansion had been provided. The real intent was to occupy and possess the new lands in advance of settlement, and secure the strategical places that would mean control and power over shipments and markets later on. The effect of this premature and in many instances needless construction was shown in 1873, as it was also in 1893, by the wrecking of many lines and the plunging of others into receiverships.

Sec. 20. Competition and Pools

The miseries of unregulated competition were clearly appreciated by 1870, and here and there railroads had united in pooling agreements that had for their object the regulation of rates and the prevention of competition. Immediately after the War many of the railroads had felt the effect of the strivings for business and the unscrupulous methods that had been developed under competition, and were looking for some means of preventing the incessant warfare that had been brought into existence under the situation. In 1870 the Chicago and Omaha pool was formed, and the success of this movement resulted in increasing the number of such organizations in different parts of the country. The public, too, felt the results of the competition. Rates were excessive, and fluctuating, and discriminating. The

small shipper was never certain of his position. The principle of charging what the traffic would bear had come to mean a distinctly different thing from the interpretation put upon it today. The classification of freights and the filling of empty cars for the benefit of certain shippers led to high local rates and great difficulties. The celebrated instance of the Standard Oil Company is fresh in the minds of all readers and hardly needs any extended discussion or explanation here. Under the conditions that existed at the time, the Standard Oil Company was able to bring to bear upon the railway companies the power of its organization, with the result that it secured discriminating rates as against its competitors. This, however, was only an instance of the general condition of affairs. The discrimination consisted of that which affected certain individuals, certain localities, and certain branches of business. In the middle section many settlers had moved too far west. Great speculation had resulted as a consequence of the land subsidies and of the promotion that went on, with the result that each community wanted a railroad at any price. Whole communities were held in the bonds of debt. The price of wheat was materially affected by the freight rates and the conditions of transportation. The railroads, too, had become greatly indebted. They were forced to keep up their charges, while, on the other hand, the farmers needed high prices and low rates. Antipathy of this kind meant nothing more nor less than warfare. In the South great industrial depression existed. The farmers were poor and there was no varied agriculture. At the suggestion of President Johnson,

data were collected, and the agent, Mr. O. H. Kelly, conceived the idea of a great organization to aid the farmer. Out of this idea came the Patrons of Industry in 1867. The idea grew slowly, and then gathered increasing power, until by 1875 there were thirty thousand branches. Early in its history this organization undertook to control elevators and railways and other commercial enterprises, and its attention was called frequently to the many abuses that had sprung up in the operation of the roads. The railroads were run recklessly, with a short-sighted point of view, and a great many favors were given to shippers as compared with the men who tilled the soil.

Sec. 21. Granger Legislation

It was only a question of time until the Granges also came in contact with this state of affairs and tried to change it. The legislation which they were able to secure begins in the State of Illinois in 1871. It was followed later by similar laws in Iowa, Minnesota and Wisconsin. These laws brought into question the right of the state to regulate industry. In the cases of Peik vs. Chicago-Northwestern Railroad Company, and Munn vs. Illinois, the Supreme Court of the United States laid down the fundamental principle that a public business may of necessity be regulated by public authority. Following these cases came others, but the Supreme Court affirmed the principle upon which the legislation had been based. The Illinois law passed in 1873 defines and prohibits extortion and unjust discrimination, levies penalties varying from one to twenty

thousand dollars, and makes it possible for persons damaged to recover triple damages. It created a commission that should make schedules for railways and determine maximum reasonable rates. This was a marked departure from the freedom which the railways possessed prior to that date, but the courts declared them constitutional in a series of decisions in the years 1876, '77 and '80.

Following the Illinois law, many States created railway commissions, armed with power to make rates, to review the books of corporations, and to control the classification of shipments. But it was early found that the state governments could not regulate the commerce that passed between the different commonwealths. This had been foreseen many years before, and the tendency had been to look forward with increasing demand to national legislation by congress. Meantime, the railroads had attempted to avoid some of the difficulties which had arisen from their reckless operation by organizing pools. As they grew in length, touching more cities, and competing with greater frequency with rivals, the problem of maintaining rates grew in difficulty. Thus the agreement between the New York Central, the Erie, the Pennsylvania, and the Baltimore and Ohio in 1877, provided for the organization of a pool by which it would be possible to avoid future misunderstandings regarding the geographical advantages and disadvantages of the cities touched by these roads. It had the further object of equalizing the aggregate cost of rail and ocean transportation between the competitive points in the

West, Northwest and Southwest and the domestic and foreign ports reached through the above cities.

Sec. 22. Rate Wars

In fact the rate wars so numerous in the latter '70s and '80s were usually followed by the organization of a pool. The rate war of 1880 was caused by a misunderstanding regarding the entrance of the Wabash into Chicago, and the pool which followed this event in 1882, known as the Chicago-St. Louis Pool, was formed to prevent such a condition in the future. Prior to the organization of the Pennsylvania pool attempts at agreement had been made and some of them fairly successful. In 1872 the coal roads had made a compact with mining companies, and the livestock dealers with the railroads centering in Chicago; the Southern Railway and Steamship Association was organized the same year, the trunk lines pooled their eastbound business in 1879, and many other examples might be cited illustrating the efforts to regulate rates and traffic.

In the rate wars referred to above, the roads in many instances would have made money by stopping operations. The rate from New York to Chicago was $7, and the reduction in westbound rates resulted in a loss of $3,000,000 from New York alone. Mr. Vanderbilt's explanation of the trunk line war was that other roads were stealing his traffic, the Baltimore and Ohio being the special sinner. The Baltimore and Ohio, however, demanded that it should have twenty-five per cent instead of eight per cent of the New York business. The war was ended by

a conference of managers and the advancement of the rates to higher levels.

Sec. 23. Attempts at Federal Legislation

Instances of this kind, however, pointed out clearly the inability of the state governments to cope with the problem. On June 9, 1868, the Committee on Roads and Canals, in the House of Representatives, submitted a report regarding the constitutional right of Congress to regulate commerce, but no definite action was proposed by them. In 1872 President Grant, in his message, proposed cheaper transportation from the West to the seaboard. Congress again appointed a committee, which resulted finally in the presentation of the Windom report of 1873. This report, with the facts which were set forth in it, created some agitation, but the problem was still far from being solved. There was a demand, becoming increasingly greater, for an interstate commerce law. This demand came from three sources,—the railway officials, who wanted a means to prevent rate-cutting, railway employes, who wanted laws compelling greater care for their protection, and the public, who wanted pools abolished and rates lowered. From 1878 numerous bills were introduced in Congress, but these seldom made much progress toward actual passage. A select committee was appointed by the president of the senate in March, 1885, and out of that committee came what is now known as the Cullom Report. The outcome of that report, to make a long story short, was the Interstate Commerce Commission Act, passed February 4, 1887. The passage of the bill was in answer to the

demand for some action. It was vague in some respects, and not clear as to its consequences. Neither the railroads nor the shippers knew just what they could do. If the railroads protected themselves, they were obliged to deny the shippers many of the facilities which they had come to regard as indispensable for their business. If they did not do this, they were forced to secret and underhanded methods in granting the necessary concessions to secure business. Neither situation was desirable, and the three years after its passage until the creation of the Sherman Anti-Trust Act were filled with litigation, attempts at enforcement, and misunderstanding. Much doubt existed as to the outcome of the act. It gradually became clear that the point of view of the nation was regulation, not confiscation; reasonable rates, and not the determination of them by arbitrary action.

Sec. 24. Trans-Continental Lines

This period of forty years was a remarkable one in the history of the railroad. It was a period in which the growing pains were cruelly in evidence, and a time that severely tested the managing powers of railroad directors and raised many a question as to the wisdom of legislation and the ability of the State, under our constitutional system, to regulate interstate commerce. Despite all the drawbacks and difficulties the Union Pacific road was built to the Coast in 1869; the Northern Pacific, though chartered in the same year, did not finally reach the western ocean until 1883; it was followed a year or two later by the Southern Pacific and the Atlantic and

Pacific. In the next decade only one railroad was built to the Coast—the Great Northern in the year 1893. Since then in the struggle for an outlet the Milwaukee and the Canadian Northern have reached the Coast, while the Frisco system and the Grand Trunk are constructing their lines to the Pacific.

CHAPTER III

THE PERIOD OF CONSOLIDATION

Sec. 25. The Character of the Period

The first third of this period, beginning with the year 1890, was a serious time for the railroads of the country. They had come through the labor troubles of the '70s, with the accompanying panic, the legislation in the different States, and the many railway rate wars of the '80s, to a new experience under federal law. The crop of 1891 was a large one, but it was followed for two years by crop failures in a number of the states and low production in others, with a resulting falling off in tonnage that markedly affected the amount of freight carried. Rates had been reduced and new economies forced upon railroad managements, with a consequent material lowering of the expenses of operation. The failure of the Baring Brothers banking house in London in 1890 presaged to wise financial leaders a possible breakdown of the monetary system of the United States, and a dismal outlook for the sale of securities and the maintenance of dividends.

To this recital of conditions should be added the uncertainty existing in the minds of the public and of the railroads regarding the interpretation of the Interstate Commerce Act: what interpretation would be placed upon the law by the Commission, and would the Anti-Trust Act passed in 1890 apply to railroads

as well as to industrial combinations? The silver legislation, which had had its inception in the act of 1878 and was extended by the act of 1890, was beginning also to have an influence upon the monetary system of the country. With the failure of the crops, the distrust of financial institutions, the uncertainty regarding the workings of the Interstate Commerce law, and the general feeling that began to prevail soon after 1890 that the country was in for a period of depression, the railroads were inevitably brought face to face with a serious situation.

The distrust of the railway companies and the attitude of the people regarding railway legislation is well illustrated in the statement made by Collis P. Huntington in 1892 in reply to a request for the construction of a railroad in Texas. He said: "Very likely you have valuable franchises, or franchises that would be valuable in almost any state but Texas, but while there are so many places in Texas where we would like to build some railroads, mostly short ones, we cannot do anything so long as the disposition exists that now seems to in Texas, that is, to do all the harm they can to this kind of property, and I think my views are shared by all the people who have money to invest. No one is disposed to create a property which after being created is not to be controlled by its ownership. I think there is no road in Texas that is today earning its operating and fixed charges. Every road, I think, has been or is in the hands of a receiver, except our great east to west line, which is supported by business going entirely through the State, which business could also be sent another way, and would be sent, except we believe

that the people of Texas will some time have a sober second thought and treat the railroads with greater consideration."

Sec. 26. Reduction in Rates

Industrial conditions, together with the feeling that business must be developed by lower charges, had brought a marked change in the railroad rates that prevailed in 1890. The average revenue per ton mile received by the railroads in the United States decreased from $1.24 in 1882 to .93 in 1890, and this reduction continued until it reached .75 in 1900. The reduction was in the main due to two things: first, the failure of the crops with the accompanying depression, and second, the necessity of encouraging the farmer, producer and manufacturer to get their products to market to the greatest extent possible. In some instances reduction was made for hauling long distances, as from Kansas and Nebraska points to the lakes. The purpose of this reduction was to help the farmers in a time of depression. Frequently the reduction involved a serious loss of net revenue to the railroads, but the managements were wise enough in the '70s and '80s to recognize that the price of corn was determined in considerable degree by the market that was open to it, and that the situation of the agricultural classes along the line was dependent upon the facilities of transportation. The continued depression that followed after 1890 created an emergency that warranted the placing in effect of tariffs which under ordinary circumstances never would have been adopted. These tariffs were not intended to be permanent, but as

they became recognized as a part of the railway schedule, the tendency was to regard them as a proper basis for the movement of grain.

The economies of operation accompanying the decline in the rates entailed upon the railroads the necessity of reducing expenses, and new methods were devised for cheapening the cost of moving freight. Heavier roadbeds and better conditions of transportation were gradually introduced, with larger engines and heavier cars, which increased the power to carry economically. The result was a marked decrease in the expense per unit of the volume of traffic. The railroads had reached the point where increase of dividends was to be secured only by the movement of greater amounts of traffic in order to secure the same amount of return as formerly. And whatever may be said of the hardships of this period, there can be no question but that they brought marked results in lower rates for the community and more efficient operation and thoroughgoing management for the railroads.

Sec. 27. Interpretation of Inter-State Commerce Act

The interpretation, modification and development of the railway law, as inaugurated by the Interstate Commerce Commission, are the main features of the second third of the period. Speaking of the Interstate Commerce Commission, less than a year after its inauguration, a well known authority says that it has been remarkable, whether looked at as a matter of history, of law or of political economy. "Instead of being an administrative body whose chief duty it

was to suspend the operation of a particular section of a particular statute, it has given a series of judicial decisions, which are read and quoted as authority, not only on the meaning of the Interstate Commerce Act, but on general questions of transportation." Continuing, the same expert says: "The authority of the Interstate Commerce Commission was as indefinite as that of the English commission in 1873, and its departure from accepted local traditions has been much wider; yet the American commission has done more work in meeting and settling questions of law in seven months than was accomplished by the English commission in twice that number of years."

But in a short fifteen years the commission was gradually shorn of its power, its acts and authority checked by the courts, and its ability to deal with the problem of transportation reduced to a minimum.

The Interstate Commerce Act provided, speaking generally, for four things: First, the maintenance and stability of rates, together with their publicity, and the right of all shippers to a fair rate without discrimination; second, a short haul clause, which, briefly stated, means that a lower charge should not be made for carrying products between competing points than is made for carrying products to stations between these points; third, the prohibition by law of the pooling of rates, of business, and of earnings; fourth, the establishment of a commission to be authorized to aid in the enforcement of the law, with the power to suspend the short haul clause under certain conditions.

The commission in its interpretation of the law undertook to adopt the principle of permitting a

charge on the basis of what the traffic would bear, with the reservation, however, that the Commission and not the railroads should be the judge of its practical applications. They recognized further that the rates cannot be based on cost of service, although they might be an element in its determination, and that different kinds of traffic might be dealt with on different principles, depending upon the conditions under which the traffic was carried. The feeling prevailed rather strongly, especially among the officers of state commissions and among the smaller business men, that the Interstate Commerce Law fell far short of accomplishing its purpose; and further, that the Commission in its contest with the railroads had not been able to secure all that was desirable and necessary. In every instance it was stated that the law was created for the purpose of helping the railways, and that it worked to the disadvantage of certain sections. The opinion was widespread that the law was a failure, even when it was obeyed; that it failed to effect the results that were hoped for when it was passed in congress.

Sec. 28. Litigation Arising from the Act

The passage of laws like that of the Interstate Commerce Act and the statutes developed in the different States resulted in a great deal of litigation. As was shown in a previous chapter, the case of Munn vs. Illinois and that of Peik vs. Chicago & Northwestern Railway clearly maintained and upheld the doctrine of the right of the state to control the rates under which public services were rendered by private corporations. The determination of the

rates, however, was still a matter of uncertainty. In a series of cases, especially in the decision of 1885, the court maintained that the power to fix rates does not give the power to destroy, and in 1888 the Supreme Court held that the reasonableness of the rate is subject to review by the courts. The Nebraska rate case finally reached the Supreme Court of the United States, and in this instance decision was rendered to the effect that a fair return on a fair value of the property is the right and privilege of the owner. Following this was an interpretation of the Kansas statute of 1897, the case being decided in 1901, to the effect that a profit of ten per cent was not unreasonable, even though the rates might be comparatively high. In other words, that profits might be large, even though the rates were fairly high. As a consequence of this series of decisions, the contention was shifted from the legislatures to the Supreme Court of the United States.

The Anti-Trust Act of 1890 was also applicable to the railroads, and this, coupled with the Interstate Commerce Law, made it possible to contest the organization of pools and agreements for the maintenance of rates. In 1897 and 1898 the Supreme Court of the United States decided adversely two important cases,—that of the Trans-Missouri Freight Association and of the Joint Traffic Association. The decision maintained that rate agreements violated the Anti-Trust Law of 1890, and that every contract or combination, in the form of a trust or otherwise, or conspiracy in restraint of trade or commerce, was illegal. Whatever powers the original commission

may have possessed in the matter of rate-making was taken away by the court.

The Alabama Midland decision, rendered in 1897, had removed from the commission the power to determine the application of the long and short haul clause of the Interstate Commerce Act. In substance this decision maintained that the existence of railway competition at the more distant points justified the charge of whatever the road may please at intermediate points, and further, what is more important, that the carrier was a competent judge as to the controlling force of the competition, without reference to the opinion of the Interstate Commerce Commission. By these decisions the original law was practically riddled and made almost futile.

"To the casual observer," says one writer, "it might seem that the movement for the state regulation of railways in the United States had come to a standstill. The Interstate Commerce Commission has failed to make headway against the opposition of the roads, statutory limitations of its powers, and the recent adverse decisions of the Supreme Court. The state boards are hampered by the limited area over which they can specially exercise authority. While the state commission system is known to be extending itself, yet there is on the part of many of the commissions a feeling of impotence and almost despair."

Sec. 29. Modification of the Law

With the passage of the Elkins Bill in 1903, and the Hepburn Act of 1906, some of the powers of the Interstate Commerce Commission were restored and

the application of its authority widened. Under the new legislation the commission now had power to make orders on the hearing of complaints, to authorize joint rates, to require the publication of rate schedules in readable and understandable form, to require the filing and publication of rates with the commission, and to enforce a uniform accounting system on the part of the railway companies. In addition to these requirements, the word "common carrier" was made to apply not only to railroads, but to express companies, sleeping car companies, pipe lines, private car lines, and navigation corporations engaged in the carrying trade, and the word "railroad" was widened so as to include switches, terminals and sidings. The maintenance of mining operations on the part of railroads is no longer permitted, and the companies are limited under the operation of the act to the transportation business alone. The last act attempts, by its penalties against rebating, to restore the powers which the commission had before the Midland decision, except the long and short clause of the earlier act. This legislation is a marked advance over the old act; yet the development of the great consolidations has made the question of rebates a thing of the past so far as the small shipper is concerned, and the great trusts, through the ownership of terminals, are still able to coerce the railways and to force them to give rebates. Looking back over the history of more than twenty years, however, there can be no question but that great progress has been made in railway legislation and the control of the federal authorities over railway property.

Sec. 30. Receiverships and Reorganization

Before the prosperous period that came into existence after the industrial depression of 1893 to 1898, many railroads passed into the hands of receivers. In the year 1891 twenty-one railroads, aggregating more than 3,000 miles, with a capitalization of $186,000,000, were sold under foreclosure. The total foreclosures for sixteen years showed 500 companies, with more than 50,000 miles and three billion dollars of capital, a result that came about largely through excessive building and industrial depression, as referred to above.

While this was going on, the United States government was attempting to secure the payment of the Pacific Railway loans, which had terminated in 1905. There was some question as to the obligation of the Pacific railroads to the government, which amounted to $125,000,000, being $70,000,000 for the Northern Pacific and $55,000,000 for the Union Pacific. Three courses were proposed: first, that the government relinquish the debt; second, that foreclosure and possession be secured; and third, that the loan be extended, at a rate of interest justified by the earnings. It was felt, however, that a bad precedent would be established if the government did not take possession and foreclose. This was done. The effect upon public opinion was very marked indeed. As shown, it was the purpose and intent of the federal government to actually carry on the work of railway regulation in accordance with what appeared to be fair and right. Here and there the process of consolidating railway lines was going on. The pass-

ing of some roads into the hands of receivers, the necessity for reorganizing others, and the wisdom of avoiding the dictation and control of the Interstate Commerce Commission over rates necessitated the bringing together of railroads in the same territory and district, in order to avoid the charge of pooling and of conspiracy. Some or all of these causes were at work. Since 1890 the Atchison system, the Richmond Terminal, the Union Pacific, the Baltimore and Ohio, the Erie, the Reading, and the Rock Island had passed through reorganizations. Two of these roads were organized twice, the Atchison and the Union Pacific. In a number of cases the reorganizations were due to the foreclosure of mortgages upon the property by the bondholders. The majority of the principal railways which failed had taxed their resources to the point of exhaustion by building extensions before the panic of 1893. Financiers had aided in the organization of roads in many instances, agreeing to take bonds and stock in return for cash that had been advanced by them, and after 1898 the banker appears as an important factor in the financing of the newly organized systems. Up to 1890 the largest consolidation of railways was only 5,000 miles in extent. The Northwestern lines were the largest system west of Chicago; the Union Pacific owned only 2,000, but controlled an additional 4,000. The consolidations were not made as rapidly in the three years after 1897 as before that date, but between 1890 and 1900 a number of systems came into existence that were more than 10,000 miles in extent. The contrast is perhaps brought out a little more strongly when it is recalled that in 1867 there

was but one road that had more than 1,000 miles; after 1877 there were eleven roads, in 1887, twenty-eight and in 1896, forty-four. This movement of consolidation was retarded by the depression of 1893-1898, but with the latter year began a new period in which the development of great systems went on rapidly. In 1907 there were 19 groups, nine of which controlled 66 per cent of the mileage of the United States. These were familiarly known as the Vanderbilt, the Pennsylvania, the Harriman, the Hill, the Morgan, the Gould, the Hawley, the Moore, and the Rockefeller lines.

TABLE SHOWING TENDENCY TOWARD CONSOLIDATION IN THE UNITED STATES.

		Mileage under 250			
	1867	1877	1887	1897	1907
Number railroads	1	11	28	44	51
Aggregate mileage	1,152	13,648	55,447	103,566	155,101
Percentage of total	6.69	20.16	43.64	54.85	65.46
		Mileage over 1000			
	1867	1877	1887	1897	1907
Number railroads	21	63	99	91	79
Aggregate mileage	8,881	27,661	45,225	44,953	38,383
Percentage of total	51.58	40.86	35.7	23.8	16.2
		Mileage 250-1000			
	1867	1877	1887	1897	1907
Number railroads	72	362	434	1,023	1,434
Aggregate mileage	7,183	26,388	26,373	40,326	43,464
Percentage of total	41.73	38.98	20.76	21.35	18.34

Mileage of Railroad Groups

The Vanderbilt Group.....21,353 miles

New York Central & Hudson River R. R.
Lake Shore & Michigan Southern Ry.
New York, Chicago & St. Louis R. R.
Michigan Central R. R.
Delaware & Hudson R. R.
Cleveland, Cincinnati, Chicago & St. Louis Ry.
Chicago & Northwestern Ry.
Chicago, St. Paul, Minneapolis & Omaha Ry.
Fremont, Elkhorn & Missouri Val. R. R.
Lake Erie & Western R. R.
Pittsburg & Lake Erie R. R.
Indiana, Illinois & Iowa R. R.

The Pennsylvania Group.....15,870 miles
- Pennsylvania R. R.
- Pittsburg, Ft. Wayne & Chicago R. R.
- Pittsburg, Cincinnati, Chicago & St. Louis R. R.
- Baltimore & Ohio R. R.
- Philadelphia & Reading R. R.
- Norfolk & Western R. R.
- Long Island R. R.

The Harriman Group.....14,725 miles
- Southern Pacific R. R.
- Union Pacific R. R.
- Oregon Short Line R. R.
- Oregon Railroad & Navigation Co.
- Leavenworth, Kansas & Western Ry.
- Illinois Central Ry.

The Hill Group.....20,242 miles
- Chicago, Burlington & Quincy R. R.
- Burlington & Missouri River R. R.
- Great Northern Ry.
- Northern Pacific Ry.
- The Erie Railroad.

The Morgan Group.....18,879 miles
- Lehigh Valley R. R.
- Southern Railway.
- Cincinnati, New Orleans & Texas Pacific Ry.
- Mobile & Ohio R. R.
- Central of Georgia.
- Atlantic Coast Line.
- Louisville & Nashville.
- Nashville, Chattanooga & St. Louis.
- Georgia Railroad.

The Gould Group.....16,520 miles
- Wabash Railroad.
- Missouri Pacific Ry.
- St. Louis, Iron Mountain & Southern Ry.
- International & Great Northern Ry.
- Wheeling & Lake Erie R. R.
- Western Maryland R. R.
- West Virginia Central.
- Texas & Pacific Ry.
- Denver & Rio Grande Ry.

The Moore Group.....13,028 miles
- St. Louis & San Francisco Ry.
- Chicago, Rock Island & Pacific Ry.

The Rockefeller Group.....10,293 miles
- Chicago, Milwaukee & St. Paul Ry.
- Delaware, Lackawanna & Western.
- Missouri, Kansas & Texas.
- Colorado Southern.

The Hawley Group.....5,864 miles
- Chesapeake & Ohio.
- Toledo, St. Louis & Western.
- Chicago & Alton.
- Minneapolis & St. Louis.
- Iowa Central.
- Toledo, Columbus & Hocking Valley.

Sec. 31. The Basis of Consolidation

The principle of such consolidation has changed, and the basis of it to-day is the evident intention of securing a territorial grouping. The purpose of doing this is to develop better opportunities for securing business, to eliminate competition, and to create a monopoly in a geographical area. The earlier consolidations attempted to secure business by feeders to strategic points, endeavoring to develop a strong position thru which it would be possible to take care of the business and to carry it with the greatest economy. The point of view was that of a well organized, well projected fighting machine in competition with its rivals in the same field. The later idea, that which governs the consolidations of the present, is to check and prevent all competition and to absorb into the system all of the lines which cover or touch a given territory. Oftentimes the following of this principle of organization has compelled a road, in order to obtain an entrance into a large city or to secure possession of terminals, to practically dominate the entire geographical section. This policy is well illustrated in the instance of New England, where the field is divided between the Boston and Maine in the north and the New York, New Haven and Hartford in the south, though both are practically controlled by the same financial group. The same tendency can be observed in the northwestern, central, southern and southwestern states. In 1904 the Great Northern and Northern Pacific railways purchased jointly the Burlington Railway, organizing the Northern Securities Company for the

purpose of owning the bonds and stocks of the three roads. So patent was the purpose of this movement, that the federal government brought action to dissolve the corporation and to require the return of the securities to the original owning companies. The case was decided in 1904, when the Northern Securities Company was declared illegal. This decision checked the consolidation movement temporarily, but it was succeeded by a modified form of control through the purchase of majorities of stocks by single companies.

Sec. 32. Summary of the Period

In some of the states the legislature has passed what are known as two-cent fare laws. These laws require the railroads to operate trains and carry passengers at a two-cent fare per mile. In the field of freight rates, however, the prosperous times of 1900 and 1901 brought an increase in the expenses of operation, in wages, and cost of material that seemed to justify an increase in the freight rates. Through the action of the trunk lines in January, 1900, changes were made in the official classification that resulted in an actual increase in the cost of moving freight. The railroads had also increased the size of their locomotives, enlarged their freight cars, placed heavier steel on their tracks, and materially increased the earning tonnage of their freight trains.

Looking back over the period, it can be seen that gains have been made in many directions. Railroads are more efficient and better managed than they were in the previous period. The principle of federal control has again been restored, after all the modifications by the courts of the land, though the problem

of federal control has not yet been completely solved. There seems to be, on the surface at least, a tendency on the part of the roads to accept the legislation now enacted and to settle down to a considerable period of peace and prosperity in the working out of the traffic questions with which they are concerned.

At the end of the period referred to in the foregoing came the brief period of Federal control, 1918-1920, when the railroads of the United States were taken over by the Government and operated by the United States Railroad Administration under a director-general. The purpose was to facilitate the transport of troops, munitions and supplies while the country was engaged in the World War. During this period the roads were taxed to their utmost to handle the traffic, and opinions varied as to the effectiveness of government control. Little was done for two years in the direction of upkeep, few locomotives and cars were added to the equipment of the carriers, and when the roads were returned to their owners, March 1, 1920, under the provisions of a new Transportation Act, the powers of the Interstate Commerce Commission were largely increased, passenger and freight rates were soon raised and loans made to the carriers from a revolving fund to enable them to rehabilitate themselves and earn sufficient to provide a fair return of 5½ per cent on the amount of their capital investments. The period of post-war reconstruction is now (1921) fairly in progress. While the roads were under Federal control the Government's loss in their operation was $900,000,000.

PART II

ORGANIZATION AND FINANCING

CHAPTER I

INCORPORATION AND CAPITALIZATION

Sec. 33. Railway Capitalization

Big enterprises require large organization for their successful culmination. The railways of the United States, taken together, represent the greatest single vested interest in the world. Their nominal capitalization, stocks and bonds amount to more than sixteen billions of dollars. On these securities over $500,000,000 are paid annually in interest and dividends, which, if capitalized at the prevailing bank rate of interest, would represent a cash valuation of twelve and a half billion. Averaged on the basis of population, there would be $160 for each inhabitant, or $800 of investment for every family in the United States. In no other industry is the extent of the fixed plant so great or the character of the business so thoroughly limited by the nature of the equipment. The rapid accumulation of wealth in America, together with an increasing demand for the services of transportation, have alone made possible the tremendous growth and organization of the railroads.

Sec. 34. The Development of the Corporation

The division of the aggregation of capital into shares of stock and into "denominational" bonds has materially aided in the distribution of the capitalization over large areas of territory and in the hands of many purchasers. Before the creation of the corporation in its modern form the big enterprises of the time were limited and checked by the unlimited liability of the investors and the fact that it was difficult to dispose of any considerable part or share of the capital stock in the markets of the day. The corporate form of organization contributed a great deal to this movement. As defined in the law, the corporation is an artificial person authorized by the law, or created under the authority of the law, from a group or succession of natural persons, and having a continuous existence irrespective of its numbers, and with powers and liabilities different from those of its members. The powers which have been granted to it are those of suing and being sued in the corporate name, to create by-laws and statutes for its government, to hold and purchase land, and to make contracts. Over the older types of organization the corporation possesses specific advantages, which are those of perpetual succession, representative government, limited liability, and division of capital into shares. Through the medium of perpetual succession, a corporation never dies, except as limited by statute, and continues to live year after year regardless of the life or death of the men who have organized it. Under the principle of representation, the shareholders have the right to elect direc-

tors and to place in their power the government and control of the company. With limited liability upon the shareholder, he feels that it is safe to invest a larger amount in the capital of the concern than would be possible if he were held for the full indebtedness of the corporation.

To corporations engaged in constructing transportation and communication facilities, the state, in order to assist them, granted what is known as the right of eminent domain. Under this right a corporation may condemn, for its own purposes, the lands of private citizens. In granting this privilege the state proceeded upon the supposition that the corporation was carrying on what was fundamentally a public enterprise, which, because of the conditions and limitations upon the state, could not be undertaken by its own authority, and therefore as a sovereign power, it delegated to the corporation a part of that power. The whole object in creating a corporation is the accomplishment of some public good. The ordinary division of them into "public" and "private" has a tendency to confuse and to lead to error, for unless the public are to be benefited, it is no more lawful to confer exclusive rights and privileges upon an artificial body than upon a private citizen. An authority upon the corporation says, that "a private corporation is a contradiction of terms and has no place in the sound organization of society." Every railway, however, is by the very nature of the service which it renders a quasi-public corporation, and as such subject to the direction and regulation of the state. To put it again, in a somewhat different way, the state is the primary sovereign group, the cor-

poration is the secondary, derivative and subordinate group, and in order to accomplish the purpose which the state has in mind, authority is granted to individuals to act as groups.

Sec. 35. Classification of Corporation Laws

The States in providing regulations for the organization of corporations have not attained uniformity of legislation. They can, however, be divided, so far as their laws are concerned, into three general groups: first, those permitting incorporation for any lawful purpose, or for any purpose for which individuals may lawfully associate; second, those permitting incorporation for any lawful purpose except the various classes of quasi-public corporations usually exempt from general laws governing manufacturing companies; third, those enumerating specific purposes of organization. At one extreme is the state of Pennsylvania, which will not grant charters for more than one purpose, and at the other extreme are to be found New Jersey and Delaware, where charters are granted for widely divergent purposes. If a corporation wishes to secure control of an established branch of industry, it will undoubtedly incorporate in Delaware or New Jersey, since in both of these States an organization is permitted to carry out more than one purpose. An example of this fact is found in the instance of the Carnegie Steel Company, whose objects as set forth in its articles of incorporation cover, as one authority says, the whole field of human activity. While a corporation is not a citizen of the United States, and has no claim to the privileges and immunities of citizenship under the consti-

tution, as would be interpreted in the case of an individual, it is nevertheless an artificial creation of the state in which it is incorporated, and has, as a result, certain rights, powers and immunities under the common and statute laws of that commonwealth. It is also privileged to carry on its operations in other States, just as it does within the boundaries of the commonwealth within which it was incorporated. The other States, however, may, if they desire, refuse it recognition and debar it from the privileges of the courts and conduct of business inside of their boundaries.

Sec. 36. The Corporation Charter

The formal grant of authority in a stated instrument is called the charter. It has been described by some writers as a contract between the state and the corporation, under which it is agreed that the corporation will undertake, in view of certain rights and privileges granted to it, to construct a railway. It is not the charter itself which is protected, but the relations established by the instrument. Thus the ordinary contracts contained in a charter are (1) those between the state and the incorporators, such as the franchise for acting as a corporation, the exemption from taxation, or that the charter shall not be subject to amendment or repeal without the consent of the corporation; (2) contracts between the corporation and the stockholders; and (3) contracts between the corporation and persons dealing with the corporation. In the charter is given the authority to exercise the right of eminent domain, to act as a person, to utilize the privilege of limited liability, to

sue and be sued, and to continue in existence during a term of years. Formerly charters were granted by petition to the legislature, and the result was a great variety of instruments with unusual powers, that are now curiosities to the political scientists. To-day charters are granted with few exceptions under general acts, and greater uniformity is to be found in them than formerly. As this uniformity comes to be a more important part of state legislation, the tendency on the part of corporations to seek incorporation in foreign states will grow less and less as time goes on.

Returning to the question of capitalization, a distinction can be made between the attempts to provide funds for small and large enterprises. In the small enterprise the promoter comes into close contact with the inventor, and if he can persuade him that a goodly income is to be secured by becoming a member of the company, little difficulty is found in commanding the necessary funds to carry on the undertaking. But in the larger corporations, where the capital aggregates millions of dollars, the promoter's work is more difficult and he is compelled to deal through syndicates, banking houses, and trust companies. The division of the capital into shares, preferred and common, greatly facilitates the sale of securities and the promotion of corporations on the modern scale.

Sec. 37. The Promotion of Corporate Enterprises

The promoter has been defined as "the man who discovers and assembles the proposition." The discovering of the proposition is the ascertainment of

its nature, the terms under which it can be undertaken, and the possibilities of receiving an income from its operation. The assembling of the proposiiton is the securing of control of it under such form as to make possible a definite statement as to purchase and control. The method followed by the promoter in this connection is to secure possession of the plants by purchase or by option, and gain for a period of time a certain control over the enterprise. The purpose of discovering and of assembling is to float the proposition and to secure the capital necessary for the construction and operation, if it is a railroad. In modern times the promoter is required to present the results of careful examination of properties, a clear analysis of the earning power, and much technical information as to grades, cost of equipment, and other questions connected with the development of the railway.

Looked upon as a distinct element in the financing of the enterprise, promoters may be divided into three classes. First, the industrial promoter, who comes from the ranks of the industry itself, a man familiar with its organization and possibilities, as illustrated in the case of Mr. Gates in the steel industry, and Mr. Nixon in the ship-building industry. The second class is the professional promoter, who makes a business of discovering enterprises that can in his opinion be financed and sold in shares to the owners of capital. Judge William H. Moore of Chicago, the organizer of the tin plate combination and of the Rock Island Holding Company, which, it should be mentioned in passing, has been broken up, is an example. The third class is the occasional pro-

moter, who has no connection with the industry, is not engaged professionally in attempting to develop enterprises, but who, as a result of observation, comes in contact with an enterprise which in his opinion can be financed.

In a previous paragraph a brief statement was made of the methods of work followed by promoters. By the use of cash, the promoter may obtain an option upon the purchase of the plants, or by the issue of stock in various amounts, he may be able to buy outright the properties necessary for the success of his scheme. These two methods, and combinations of them, cover practically all of the ways in which a promoter secures control over the original company, and after organizing a new corporation through the issue of stock and its sale on the stock exchanges, he often manages so successfully as to pay the bills that have accrued against the organization and retain part of it as the working capital, putting what is left in his pocket as his reward for his industry and foresight. In organizing the United States Rubber Company the promoter received five per cent of the stock, in the instance of the Rubber Goods Manufacturing Company, for each $100 paid in cash a similar amount was issued in preferred stock and $90 in common stock, the promoter receiving ten per cent of the common stock; the organizers of the American Smelting Company received $30 in common stock; and many other instances might be cited, as in the case of the United States Steel Company, where the promoters are said to have received more than $40,000,000 as a return for their enterprise in bringing that corporation into existence. The promoter,

however, unquestionably undergoes a considerable risk in advancing money, as he practically buys the securities through the issue of stock or by the use of the money he has received from the actual purchasers.

Sec. 38. The Speculator and Investor

The first auditor whom the promoter seeks is the investor. He hopes to interest him in the plan on the ground that a return will be earned by the corporation, but if he is not able to do so, he is compelled to turn to the speculator. The difference between the speculator and the investor is that the investor is looking for a place to put his capital where it will earn a given return. He expects safety and continuance of earning power. The speculator buys on a small margin and wants big returns. In recent years banks and financial concerns have gone into the business of underwriting the capitalization of large enterprises, and they have taken over blocks of stock and bonds largely on a speculative basis, agreeing to furnish the money, providing the margin is wide enough.

Promotion of an enterprise, therefore, passes through many stages before it reaches what might be called an investment. Where the investor and speculator are not available for the capitalization of an enterprise, promotion is sometimes undertaken by exploitation, by securing the subsidies or grants from individuals and communities. Thus in the early history of railroad building many lines secured the capital necessary for their construction by gifts of land, of rights-of-way, of materials, and of labor; and

many times corporations have been granted undue powers, from the present point of view, because the community felt that it was in great need of the railway. Indeed, it may be said that the charter provisions of railway companies are often to be measured by the necessity of the community from which they received them. It usually happens that in order to draw capital from a new field some bonus is required, and in the United States the ownership of a part of the public domain was brought about through the promotion of transportation companies. In other words, in order to secure land, it was necessary to build railways.

Sec. 39. The Survey of the Line

An important factor in the organization of a railway is the survey. Upon the report of the engineer depends the feasibility of the route and really the fundamental basis of the enterprise itself. In the carrying on of the survey three stages are to be noted: First, what is called reconnoisance, a sort of viewing of the situation, the fixing upon the terminals, and the attempt to get a line upon the country and territory through which it is proposed to build the road. But the information thus secured is general in character, and any continuance of the project to something like a definite stage requires an additional survey, in which data is secured for the definite selection of the route of the railway. Oftentimes several such surveys are made in widely different territory. But after the preliminary surveys have been made and the promoters of the road have determined upon the course of the road, it is followed

by the locating survey, which is based upon the principle of securing a line of travel that will bring the largest traffic at least expense. This involves a long and tedious examination of soils, drainage, rainfall, and the general economic conditions of the country through which the road is to be built. It deals in detail with distances, with curvature, with gradings, and the cost of the line. As the survey goes on, questions of low first cost versus high operative efficiency are constantly coming to the front. This, in fact, must be determined before any building can be undertaken. The new roads that have been built in the last few years, like the Chicago, Milwaukee and Puget Sound and the new West Virginia line from the coal regions of that State to tide water, are constructed on the basis of a high operative efficiency. In competition with other lines it means in the long run that larger earnings will be secured through the operation of longer trains and heavier loads.

Sec. 40. The Basis of Capitalization

While a number of theories are held regarding the basis of capitalization, but three will be referred to: (1) The popular theory is that capitalization should be based on the original cost of the property or the actual investment in the enterprise. In such a case the stock and bonds should represent money paid in, and from the point of view of the public it is contended that investors are entitled to a return upon this amount and nothing more.

(2) Opposed to this view is another which regards the basis of capitalization as the earning power of the corporation, regardless of the amount of investment in it.

On its face the popular theory appears to be a satisfactory one, but so many considerations enter into the proper expenditure of money and the investment of funds in the construction of a railway, that it is impossible to simply say that the amount of investment shall determine the basis of capitalization. In one instance, heavy costs and unusual labor and construction charges might place the capitalization at a great deal higher figure than the condition warranted as compared with other roads. On the other hand, the appreciation of property, especially of land grants, makes it desirable, if the originators of the road are to secure the return they are entitled to, that the capitalization be increased from time to time to correspond with the value. But from the point of view of railway financiers, capitalization on the earning basis makes possible the concealment of profits and the absorption of increasing revenue, without arousing the suspicion and indignation of the community, which are likely to result in demands for lower rates. High capitalization is argued for also on the ground that it is easier to sell a big concern than a small one.

From the point of view of the state, capitalization on this basis obscures the relation of shipper and carrier in the rates which are charged, and makes it difficult for the state to ascertain the actual value of the services rendered. The cost of reproduction does not, on the other hand, furnish a real basis for determining capitalization, neither does earning capacity, but a combination of the two seems to provide a satisfactory way of determining the amount of capital a railway corporation ought to carry. In the case of

Smythe versus Ames, decided by the United States Supreme Court, it was declared that the original cost of construction, the amounts expended in permanent improvements, the amount and market value of bonds and stock, as compared with original cost of construction and the probable earning capacity of the property, are factors that should go into the determination of its actual value.

Much the same point of view was taken by the Board of Tax Commissioners of Michigan, when they attempted to fix the value of the railway properties of that State for taxation purposes. To the value of the physical properties, as taken on the cost of reproduction basis, was added the non-physical elements of railway property, as found in their franchise value. The method followed by the Commission gives what is termed by some authorities the true basis of capitalization, since it represents both the cost of reproducing the property and the franchise value arising from the surplus earning capacity over the interest on the value of the reproduced property.

(3) The Supreme Court of the United States, in the Knoxville Water Case and the Consolidated Gas Case, presented a third theory of capitalization which is entitled to great consideration. It is to the effect that a deduction for depreciation must be made from the estimated cost of reproducing a plant when determining the present value of the tangible property, for the purpose of testing the reasonableness of the rates charged. The rate of interest and the rate charged for moving traffic are corelated in determining the value of a railroad, in that "it

depends upon what it can earn on the basis of a reasonable rate, and the reasonableness of the rate depends upon the return which it will yield upon the value of the property."*

Sec. 41. The Present Attitude Toward Corporate Organization

It will be seen from what has been presented in this chapter, inadequate as it is from the want of sufficient space, that the organization of a railway requires wide knowledge and foresight, bringing into use the financial powers of the community, the skill of engineers, the wisdom of bankers, and the faith of investors. In the course of railway history much progress has been made toward more scientific organization. The state governments no longer take the part of constructors for private initiation has been proven sufficient to undertake the greatest enterprises, though the states have invariably held to the doctrine that the railroads were quasi-public corporations, and therefore subject to regulation. With the coming of the bankers into the field of railway finance, and the wider publicity of corporate accounting, much of the opportunity for the old stock watering schemes has been removed, and the abuses and shameful practices in the history of the Erie, Wabash, Union Pacific and other roads are now warnings pointing the moral of decent finance. And, what is more to the purpose, the principles that were violated then are now held to be essential to the success of the largest enterprises in the field of railway construction, management and operation.

*Report of Interstate Commerce Commission, vol. IX, p. 391. Supreme Court Reporter, vol. 29, No. 5, pp. 148, 192.

CHAPTER II

FORMS AND AGENCIES OF CAPITALIZATION

Sec. 42. Stock and Bond Holders

From the day the plan of a railway is first conceived until it is completed and trains operated there is a constant demand for funds. The projectors of the company are in the field for financial assistance, which they expect to derive from two groups of persons: first, those whom they can persuade to become partners in the enterprise, and second, those who are willing to advance them money as creditors. These two groups are known broadly as stockholders and bondholders. The first is influenced by the earnings principally, and incidentally the safety of the enterprise. The second places the emphasis upon safety and hopes for a fair return. The stockholder is a partaker in the risk of the undertaking, and understands fully that his share will rise and fall in value as the earnings of the corporation change from time to time. The general supposition is that the bondholder has a security which rests upon the property as such, and that, in case of failure to receive his interest, he can, under the rules of law, foreclose his mortgage and take over the property. This supposition arises from a disregard of the nature of the railway business. Unlike a house or a farm, it can be used for one purpose only. And further, it is difficult to sell it to others than those who are interested directly in its use for transportation purposes. In the

long run, therefore, the lien of a railway bond is shifted from the real estate to gross earnings and finally to net earnings. As will be shown a little later in the course of this chapter, a sale, in the case of foreclosure of a mortgage held by bond owners, is really a legal fiction, and the appointment of railway receivers is merely a method of affirming the fiction and making possible the reorganization of the road by those who are interested in its operation. The bonds of a railway seldom amount to more than the minimum value of the property. Occasionally by deception the amount secured has been larger than the minimum value, and the original projectors have been called upon to make but small contributions to the carrying on of their plan. In new countries where the whole venture of a railroad enterprise is speculative, the bonds become speculative also; but under ordinary circumstances where there is a value because of the development of the road, which does not depend merely upon future growth, the bonds have an actual value, and in such instances the stocks represent the difference between the minimum value and the necessary cost of the road. In cases where roads are built through districts where the population is not widely scattered, the element of monopoly which adheres to all railways, practically assures to the owners of bonds at least a certain fraction of income which is not inherent in the railroad enterprise as such.

Sec. 43. Forms of Stock Certificates

A share of stock has been called by the courts "an incorporal, intangible thing." It is not a part of the

capital, since that is the fund with which the corporation transacts its business and purchases its property, real and personal; but it is the right which shareholders have to participate in the profits of the company. The corporation as an organization holds its property in trust for the shareholders. The certificate which is issued to the shareholders is a written acknowledgement on the part of the corporation of the interests of the stockholders. These certificates are not negotiable instruments, except by transfer.

The two forms in which stocks are issued are *common* and *preferred.* The common stock is specifically a risk-taking share, without any guarantee as to the payment of interest, either in amount or time. The preferred stock is a preferential share, entitling its holder to priority in dividends. Its issue is limited by the provisions of the charter, and unless otherwise provided, preferred stockholders have the same rights as the common stockholders in the management of the company. The holders of such stock are not creditors in the sense of bond owners, but are preferred risk-takers. In order to encourage the purchase of such stock, cumulative features have been added to it, which provide that the owner, in the case of the passing of a dividend, may receive the deferred dividends from the earnings of the company set aside for such purpose before any payments are made upon the common stock. The earnings of the corporation depend upon the volume of business, the rate at which it is done, and the cost of operation. These fluctuate constantly, though more in one community than in another, depending upon the general

character of the industry in which the people are engaged. The device of cumulative preferred stock tends in times of depression to pile up a dividend obligation against the company, which, while it is not prepared to pay at the time, it must pay sooner or later, and it reacts against the value of the common stock. It also prevents accumulation of a reserve which should be created for the purpose of meeting the variations in profits. During a ten years' period the Pennsylvania Railroad reserved of its profits about fifty per cent, the Northwestern twenty-six per cent, the Chicago, Milwaukee & St. Paul twenty-seven per cent, and the Great Northern thirty-six per cent. Action of this kind on the part of railroad directors forestalls any possible breakdown in the payment of dividends and offsets the necessity of the cumulative feature in the preferred stock.

Sec. 44. Forms of Bonds

Bonds, as already shown, are resorted to as a means of securing funds to the extent of the minimum value of the property, and in the practice of railroad finance a variety of forms have been developed which differ from each other in the kind of lien that has been placed upon the property to insure payment of interest on the principal of the bond. Bonds may be broadly classified as to extent of security and as to payment. In the first instance the nature of the bond depends upon the remoteness of the security, whether it is a first, second, or consolidated mortgage, and upon the nature of the property offered, whether equipment, land grant, or actual roadbed. The extent of the security as used in this

connection also refers to the amount of property actually offered, whether it covers the whole system or is merely upon a division or upon subsidiary roads under lease or indirectly controlled. In the second case the nature of the bond depends upon the conditions of payment. In some instances the provisions of the bond require the payment in gold or in legal tender; in others they indicate that it is a registered bond or a coupon bond. It may also be redeemable in a given period, or converted into stock, or extended.

The value of a bond depends upon eight points. First, as already indicated, the underlying security; second, the earning capacity of the corporation; third, the credit of the underwriters who are undertaking the distribution of the bonds and their method of doing it; fourth, the laws of the state in which the corporation operates; fifth, the credit of the guarantor; sixth, the date of maturity; seventh, the right of the bondholders to share in the equities, which in the last few years have amounted to great sums, as shown in the history of the Great Northern in its distribution of the iron ore certificates, and in the case of other roads whose property has increased in value beyond the capitalization; and eighth, the marketability of the bonds. In cases where corporations have real property, possessing tangible value, the resort to the issue of bonds instead of increasing the stock capitalization is a well recognized financial method, since the interest on the bond is likely to be less than the dividends which would be paid, in the instance of a satisfactory business, upon a like amount of stock. The difference will represent an

increased dividend for the stock already issued. On the other hand, where there is great uncertainty in the enterprise, the continuance of it and its management would in all likelihood be less interfered with if the capital could be secured by the sale of stock, since the fixed charges against the company would be less in such a case.

Reference was made above to the different forms of bonds issued by railway companies. The following list includes all of the important types of bonds issued by railway corporations. They are First Mortgage, Second Mortgage, Consolidated, General, Car Trust, Terminal, Debenture, Income, Equipment, Land Grant, Divisional, and Collateral Trust.

The first four of this list of bonds represent the relation existing between different groups of creditors and the property. The *First Mortgage* is a prior lien bond, and the holder of it has first claim upon the property, regardless of other securities that may have been issued. The *Second Mortgage* bonds represent a new issue over and above the first group of bonds, and are usually put out for the purpose of extending the property. *Consolidated* bonds represent an issue covering two or more groups of bonds which have been refunded and consolidated into one great obligation; while the *General* bonds are those which have been issued under a blanket mortgage covering the entire system. These may or may not be First or Second Mortgage, and usually are issued after other mortgages have been laid upon the property.

The so-called *Car Trust* bonds are really notes, a sort of equipment certificate issued for the purpose

of paying for equipment on the installment plan. Under the provisions of the Car Trust bond the corporation issuing it agrees to pay to the holder of such bond (usually the equipment company) its value in certain designated installments over a short period of years. It has been the method to lease the cars represented by the Car Trust bonds to the railroad issuing the bonds, and under the terms of the lease the railway company agrees to pay a rental sufficient for all interest charges, taxes and the principal of the certificate in a certain number of annual installments. An example of this type of bond is found in the Pennsylvania Steel Car Trust, gold 3½ per cent bonds.

The bonds designated as *Terminal* are described in their name. These bonds are issued by separately organized terminal companies, which are controlled by the railways interested in them, for the purpose of covering the cost of the erection of stations, tracks, and the like at different points, without necessitating the increase of the capitalization of the railroads back of the terminal company. These bonds are usually sold above par, and where they are first liens upon the terminals represent unusual values.

The *Debenture* is really not a bond at all, but a promise to pay put in the form either of a registered or a coupon bond. Where this type of financial security has been issued the facts will show that the company has mortgaged all of its property and is unable to issue bonds which will have a satisfactory security back of them. The value of this type depends entirely upon the general credit and resources

of the company rather than upon the nature of the property which it owns.

The *Income* bond is another type of debenture, where it is payable out of the surplus net earnings of the company issuing it. Like the preferred stock, the interest is conditional upon the earnings left after the payment of certain fixed charges. In case there is nothing left, the company is under no obligation to pay the interest for the year. It becomes, however, cumulative and stands as a charge ahead of the dividends on the common or preferred stock. As a form of bond the principal is usually secured by a mortgage which gives the creditor a standing in advance of the general unsecured creditor.

From time to time railroads have found it necessary to issue bonds for the purpose of securing the equipment necessary to the operation of the road. Such obligations are known as *Equipment* bonds, and are secured by a lien upon locomotives, cars, and other rolling stock. The security to the ordinary holder of them has little or no value in view of the fact that he would be unable to use the equipment, even if it came into his possession. This type of security is not resorted to in present day finance except in unusual instances, the short time notes in the form of car trust bonds or of debentures taking its place.

The *Land Grant* bond is described in its name, in that it is an obligation issued by the company upon the lands that have been granted to it by federal or state authority. These bonds are payable out of the revenues received from the sale of land and are a lien upon such real estate.

The *Divisional* bond referred to above may be

based upon a first or second mortgage, but has a distinct classification because it is upon some distinct section of the railway rather than upon the entire system. Usually such bonds are guaranteed by the company operating the main line, and where such bonds are issued on branch lines interesting questions often arise as to the obligation of the guarantor in the case of bankruptcy. Oftentimes the guarantor refuses to pay the obligation because of the road's inability to meet the interest charges. Where such is the case, the branch line has no recourse, and in the instance of reorganization the bondholders are compelled to throw themselves on the mercy of the owners of the main line. The Northern Pacific reorganization furnished many examples of this state of affairs.

Sec. 45. Bonds Held in Trust

In the course of financing a railway, holding companies come into possession of stocks and bonds in other companies. These they are free to pledge to the trustees to secure the performance of the obligation of the bond. In case of default in payment, the securities thus pledged may be sold at auction to satisfy the bondholder. This form of bond, when supported by good listed securities, with a sufficient margin, is a satisfactory form of security, but where collateral trust bonds are supported by miscellaneous unlisted stocks they do not possess a great deal of value. Sometimes the borrowing corporation retains the privilege of substituting other securities for those that have been originally pledged, but a condition of this kind in the original mortgage is a mischievous one.

Out of the many conditions existing in the modern organization of industry has sprung what is known as the trust company. While not originally created for the purpose of meeting the demands of railroad corporations in the financing of their bonds, nevertheless the trust company has been resorted to as a holder of securities in the disposal of nearly every bond issue. The fact that it is impossible for any one individual or group of individuals to take the entire issue of bonds on a mortgage indebtedness has resulted in the utilization of the trust company to hold the original security, against which may be issued the various mortgage notes or bonds that are offered to the public for sale. Under the conditions of the mortgage, the trust company is the guardian of the rights of the various holders. It watches the payment of interest, and in case of failure of payment undertakes the necessary steps to carry out foreclosure proceedings.

Sec. 46. The Underwriter

But, as indicated in other places, the sale of a large issue of stocks or of bonds is a difficult matter, and in order to place them in the hands of the public, the underwriter, either as a single financial institution or in the form of a syndicate, has been resorted to as a means of disposing of them. The underwriter appears as a seller of stock, agreeing to sell certain amounts of it at the price that has been accepted by the parties to the agreement, and in carrying on the work of disposing of the securities, he may do it on the basis of what is known as insurance or on the sale of privileges. In the first case there is guaranteed to

the promoter or to the corporation issuing stock the sale of a certain number of shares at a given price. This method is the one usually followed by a syndicate or banking house. The profit made by the underwriter in this case is the difference between the price which he has agreed to pay and what he can sell the stock for. In the instance of the sale of privileges, as it is termed, the underwriters pay a given sum of money, for which they receive certain amounts of shares, with an additional bonus in the common stock. In order to give the original promoters of the enterprise the opportunity of disposing of the shares of stock which they expect to issue, the underwriters withhold sale until a certain time mentioned in the agreement. At the end of the period the underwriting syndicate is called upon to make good the sum agreed upon between the underwriters and the corporation. If more shares have been sold and at higher prices than determined upon in the sale of the privileges, the syndicate makes a profit.

Sec. 47. Receiver's Certificates

A third general type of security makes its appearance in the market from time to time, usually after a period of depression. In the course of the last thirty years more than seven hundred railway companies, with an aggregate mileage of 100,000 miles, have been unable to pay the interest charges upon their bonded indebtedness. Years of depression, unfavorable legislation, excessive competition, and railroad building affected the incomes of these roads so disastrously that they were unable, when confronted by heavy operating expenses and fixed charges that

were excessive, to meet their financial obligations. The result was the creation of a large number of receivers, officers appointed by the court to take charge of the property during the pendancy of the civil action, with instructions and powers to manage or dispose of the property as the court might direct. The appointment of a receiver does not necessarily mean the inability of the road to continue its business, but may mean the intention of the road to stop paying fixed charges in order to better its condition. No receivers have been appointed because of hostile legislation alone, but most of them have come into existence because of poor management, coupled with too great capitalization, extension, and excessive competition. Thus, receivers may be what are termed friendly, or they may be stockholders' receivers or creditors' receivers, or they may be appointed by the court for enforcing a judicial decree which the road has refused to carry out, or it may be that the receiver is one representing a special interest that is dominant in the ownership of the road.

In order to meet the expenses of carrying on a defaulting road, certificates are issued by the officers of the court. These certificates under rulings of law have a standing in advance of all other forms of credit obligations. They usually bear a comparatively high rate of interest, and are retirable at the option of the receiver. Some abuses have sprung up in the creation of receiverships such as have been brought into existence for the purpose of shutting out creditors or of preventing the payment of damages, or of destroying the credit of the road in the eyes of financiers. Nevertheless, a rightly managed

receivership may be the salvation of a railroad, for it at once puts the property under rigorous management. Though it tends to break up systems and to create unfair conditions in the instance of competition, it yet remains often times the only way in which a road can be restored to a sound business basis.

An entire book might be written upon a number of the topics treated in this chapter and in the one just before it. But an outline has been given, together with definitions of terms, that will make it possible for the reader who wishes a wider knowledge to secure a definite basis upon which to build his investigations. It is well to remember that the railroad is possible only as a result, as a development of the corporation, and that all the various types of stocks and bonds have been brought into existence by men who were attempting to meet specific conditions. As time goes on and the incomes of the roads become more stable, many of the forms of security which have been issued in the past will, in all probability, be no longer resorted to, and the types of railroad securities will decrease as a consequence.

CHAPTER III

METHODS OF CONSOLIDATION

Sec. 48. Reasons for Consolidation of Railway Lines

Control is the determining principle in the organization of a railroad. The power to direct the action of a corporation means the use of it for the purposes of those who are in the majority on the board of directors. In the earlier days of railway organization the autonomous corporation was sufficient to meet the needs of small railroads; the necessity of alliances, of controlling neighboring roads and terminals in large cities, was not so apparent as at the present time. As the railroad has grown in mileage, the organization, from the legal and economic point of view, has been enlarged materially.

This tendency toward what might be termed consolidation has been hurried by the dissolution of pools through hostile legislation, the disbanding of traffic associations by decisions of the courts, and the application of the Sherman act to the railroads. The underlying forces, however, were really more economic in character than the tendencies referred to above. There was, first of all, the desire for control of larger mileage, without much respect to its economic relations, on the part of a few corporations; and here and there directors in control of the management of corporations sought to manipulate the

stock market by increasing the issues of stock or by lowering the price through changes in the balance sheets. These two causes being eliminated, the real reasons are to be found in the honest effort to get more business by extending the lines to new cities and into new territory.

To prevent competition was another reason. The experience of the '70s and early '80s taught many a lesson, as has already been shown, and the desire to avoid legislative action and the hostility of the courts led the roads to expand their organizations and to attempt to come into the possession of larger mileage.

To these causes already enumerated may be added the desire to secure the economies which came from more extended operation, and also, later on, to dominate a larger area which was a geographical unit, and over which the larger railway organization might practically act as dictator in the matter of rates, classification of freights, and the movement of tonnage.

Sec. 49. Methods of Securing Control

The domination of a corporation, through use of its instruments of organization or its actual tangible property, is possible in a variety of ways which have been adopted with advantage and satisfaction in many instances. Thus, (1) through the medium of a lease a corporation may make terms advantageous to itself for the control of a railroad that is contiguous to it; (2) by holding a majority of the stock through ownership either by the company or by individuals who are closely affiliated with the parent organization, it may be able to determine the

policy of the company; (3) through a form which has been developed, called community of interest; (4) by the actual ownership of the property through holding corporations; and (5) by advancing the cost of construction, which has been done here and there by companies that were thus able to come into the ownership of the mileage after it has been built.

Control of whatever character, whether through lease, the possession of stock, community of interest, holding corporations, or construction advances, may be either direct or indirect. It is direct when exercised without the interposition of an intermediary. If, however, a second or third corporation intervenes between the parent organization and the company over which authority is desired, the control is indirect. In a similar way the control may be sole or joint in character. The first is true when corporations are sufficiently strong financially to actually dominate the company without the assistance of another organization. There are, however, many instances in which joint control is to be seen, where it rests in two or more persons or corporations. Such joint control implies always some formal or informal understanding among the controlling corporations. In recent years large organizations have been built up through these different methods of control. The command over them varies from that seen in the personal type of organization, as illustrated in the Hill and Harriman groups, to the bureau type, well shown in the instance of the Pennsylvania Railway Company. In the cases of the first two groups of railroads mentioned above there is a marked uniformity of administrative sys-

tem, subservient to a great personality. In the other instance, the Pennsylvania Railroad exhibits a type of organization where there is a clear assignment of duties to men perfectly capable of undertaking them, and in case of any disarrangement of the plans or breakdown in the organization through the death of its head, no change of policy ensues, as would undoubtedly be the case in the instance of the Hill and Harriman groups. Under a personally organized system of administration a change in the man at the head wipes out the old regimé, with the result that a new comer will attempt to make over the organization, with undoubted loss in efficiency for the time being.

Some question as to the truth of this statement has been raised since the death of Mr. Harriman, but too short a time has intervened to really test the matter of organization and change of administration.

A few examples of these methods of control will illustrate the point.

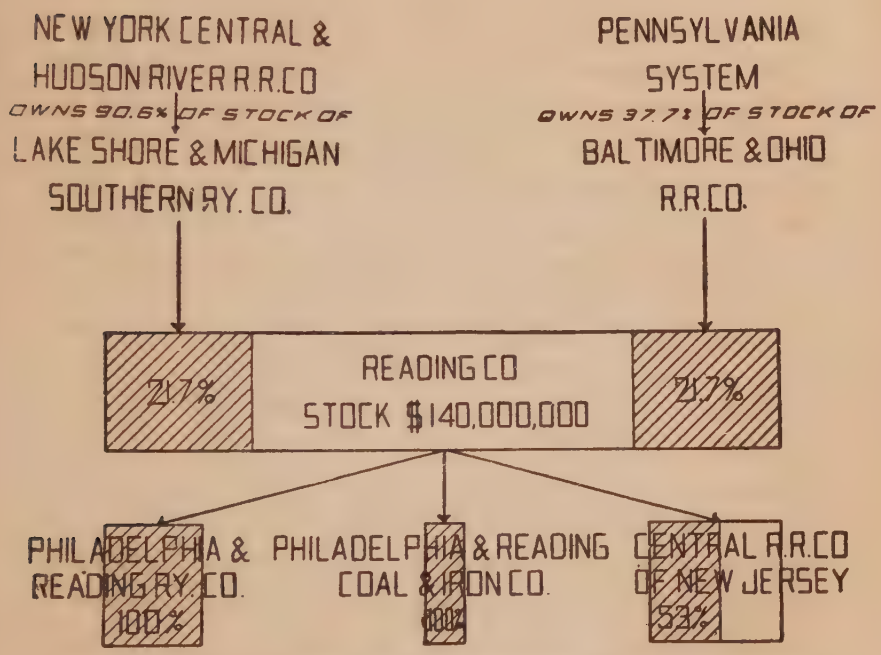
Sec. 50. Control by Lease

(1) The Great Northern Railway Company, though a holding concern, has been compelled to rely upon leases for its control over the many lines that make up its system. The same is true of the consolidations found in New England. The Boston and Albany is controlled by the New York Central through the medium of a lease; the Boston and Maine holds a lease upon the Fitchburg Railway; the New York Central leased the West Shore Railroad for a period of 999 years, and recently the

Minneapolis, St. Paul and Sault Ste. Marie Railway secured control of the Wisconsin Central by a lease.

Sec. 51. Purchase of Stock

(2) The Pennsylvania Railroad purchased stock in the Baltimore and Ohio and the Norfolk and



From Intercorporate Relationships of the Railways of the U. S. Special Report 161. Interstate Commerce Commission.
Chart Showing Relation of New York Central and Pennsylvania Railroads in Joint Ownership of Reading Railroad.

Western for the purpose of directing their policies in some degree; the easiest means at the time seemingly was through the purchase of stock in the market.

The New York Central, to refer to another plan adopted by that road, holds sway over the Lake Shore & Michigan Southern and the Michigan Central by the ownership of a large percentage of the stock in both roads. The Boston & Maine owns a sufficient amount of stock in the Maine Central to direct its destinies.

Sec. 52. Community of Interest

(3) The community of interest plan grew out of the similarity of interests of different roads, where it was not possible for the dominating road to secure control. This policy is nothing more nor less than the representation of one road upon the directorate of another. This representation, which is intended to affect the management of one of the companies, may represent a majority or merely a minority interest. One of the best instances of this type of policy in railroad management is to be seen in the history of the Northern Pacific Railroad. The president of the Great Northern road desired a closer affiliation with the Northern Pacific, and recognizing the need of a Chicago connection, the two roads endeavored to secure representation upon the directorate of the Burlington. The story of the warfare brought on in this attempt is familiar to all. In nominating the board which should represent the various parties interested in the Northern Pacific Railway, Mr. Morgan said: "Every important interest will have its representative, who will be brought into close touch with the situation as a whole, and there should be no difficulty in reach-

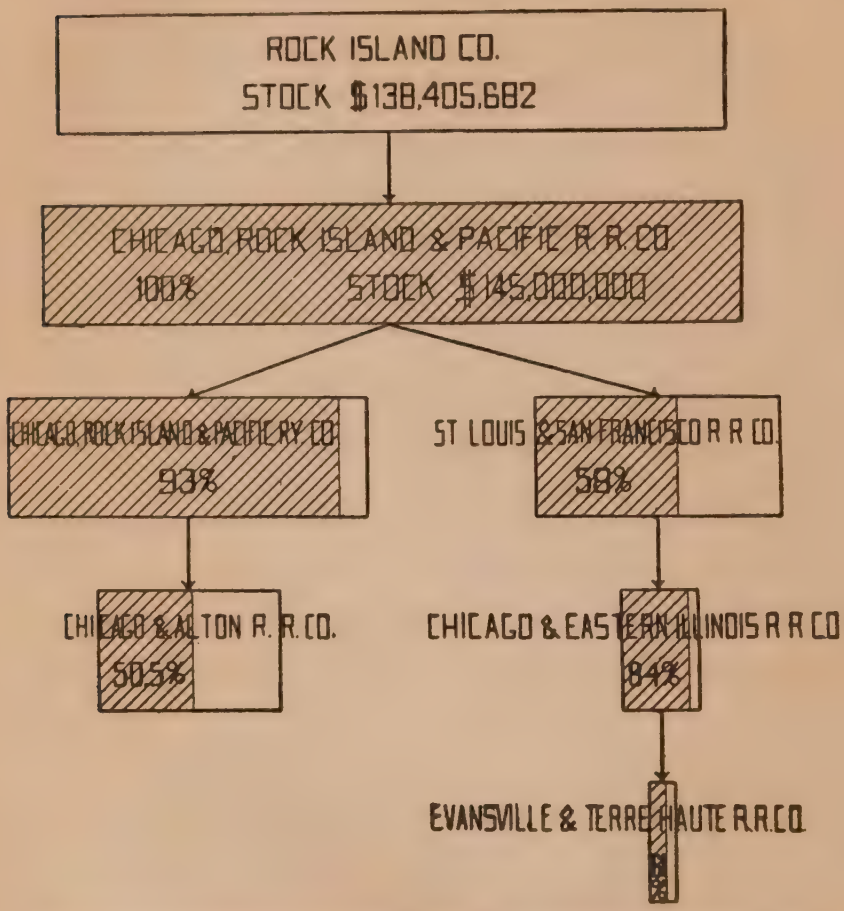
ing a conclusion that will be fair and just to all concerned and tend to the establishment of permanent harmony among the diffierent lines."

Sec. 53. The Holding Company

(4) The most efficient type of control, and the one to which most attention has been directed, is what is known as the holding company. This term is used to indicate a corporation which exists alone for the purpose of holding and dealing in the securities of other corporations. The Southern Pacific Company, the Pennsylvania Company, and the Great Northern Railway Company do not own any mileage directly, but they all operate railway properties. Such is not the case of the regular holding company. Three types of this organization are referred to in the report of the Interstate Commerce Commission upon the inter-corporate relations of railways.

(a) The first is called the simple type. This class consists of corporations organized for the sole purpose of holding stock in other railway companies. The best examples are the Rock Island Company, the Atlantic Coast Line Company, and the Seaboard Company. The Rock Island Company was organized to concentrate the control of large railway companies in a few hands. Through its organization it controls the Chicago, Rock Island and Pacific Railroad Company, a holding concern, the Chicago, Rock Island and Pacific Railway Company, the operating company, the St. Louis and San Francisco Railroad Company, the Chicago & Alton, the Chicago & East-

ern, and the Evansville & Terre Haute companies. This system of railroads has as its head two holding companies, the Rock Island Company and the

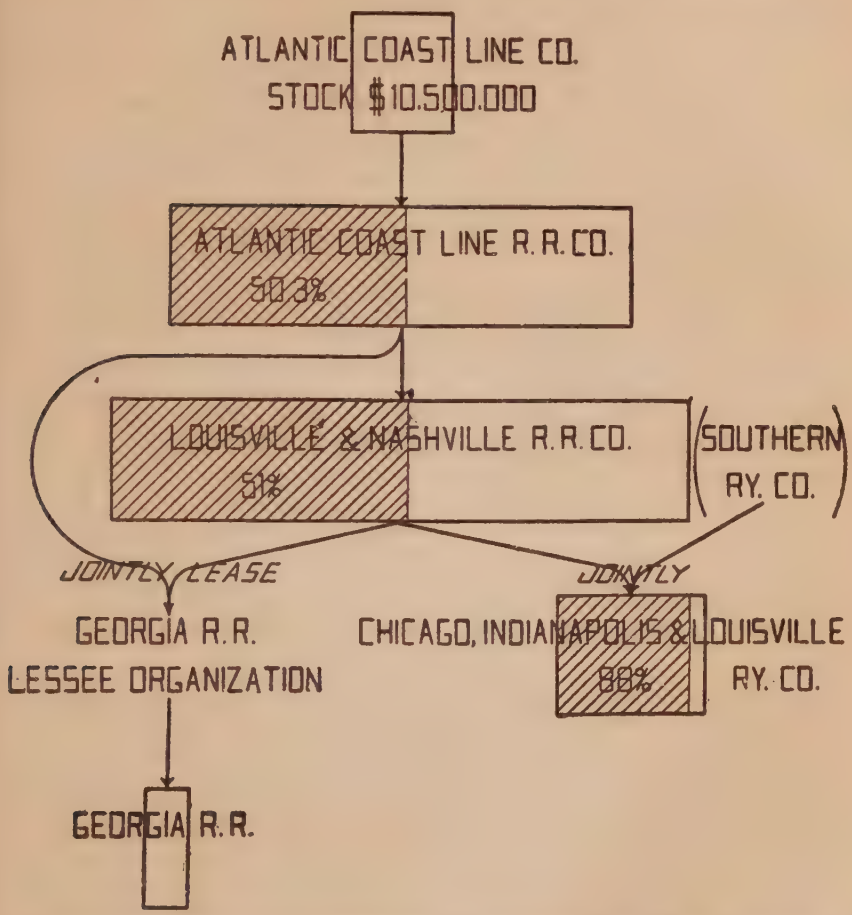


From Intercorporate Relationships of the Railways of the U. S. Special Report No. 1. Interstate Commerce Commission.

Chicago, Rock Island & Pacific Railway Company, which are responsible for the capitalization of

a third of a billion dollars before the capital of the actual operating company is reached.

The Atlantic Coast Line Company, another ex-



From Intercorporate Relationships of the Railways of the U. S. Special Report No. 1. Interstate Commerce Commission.

ample of the holding company, controls the Atlantic Coast Line Railroad Company, and through it the Louisville & Nashville Railroad, the Georgia Rail-

road and Banking Company, the Chicago, Indianapolis & Louisville Company. The Seaboard Company control solely and jointly over three thousand miles of railroad, with a capitalization of over $215,000,000.

Referring to this type of corporation, the report mentioned above says, "it is difficult to discover any economic justice in the existence of these holding companies and in their enormous issues of securities. The only rational explanation, as already noted, is their employment as a medium, by larger financial interests, to concentrate and perpetuate control."

(b) The second type belonging to the general class of holding companies is the intermediate concerns which are used to give control of one railroad over another with which it has no capital or corporate connection. An example of these is seen in the instance of the Michigan Securities Company, whose capital stock amounted to $20,000, and yet through which the Cincinnati, Hamilton & Dayton Railroad was able to control the Pere Marquette Railroad Company.

(c) A third class consists of the companies created for industrial purposes, which in the course of their business have purchased railroads through the issue of their own securities. The best example of these is seen in the instance of the United States Steel Corporation, which controls the Lake Erie and Bessemer Railroad.

Sec. 54. Advances Upon Construction

(5) Some instances of control through advances for construction have been reported to the Inter-

state Commerce Commission. The method followed was for the construction companies to build the road through advances made to them by the controlling corporation. This method has been followed in new countries where the parent corporation was anxious to conceal its identity.

In many cases the control of a corporation is brought about through coöperation with a number of other railway companies. This is to be seen especially in the case of the terminal companies, where as many as ten or twelve railway companies unite for the purpose of erecting terminal or bridge properties. The Chicago Union Transfer Railway Company has ninety-eight miles of track, with a capitalization of $2,000,000, the major part of which is held by eleven railway companies. Another instance is that of the short railway line leading to the Poughkeepsie bridge; the total capital of which is owned by the Lehigh Coal and Navigation Company and five other corporations, including the Pennsylvania Railway Company.

Sec. 55. Examples of Consolidation

The methods of consolidation referred to above are well illustrated in the case of what is called the Vanderbilt system, and for the purpose of a concrete example, both of geographical and financial consolidation, some facts regarding that organization are presented at this point.*

*The facts given in the following pages are taken from "The Anatomy of a Great Railway System," by H. T. Newcomb. Yale Review, Feb., 1905, v. xiii., p. 347.

"The Vanderbilt system of railways consists of some twenty thousand miles of line lying in the United States and Canada, with eastern terminals at New York and Boston. Westward its lines extend to the Dakotas and Wyoming, while they gridiron the great industrial states of the Middle West and the granger states of Iowa, Illinois, Wisconsin and Minnesota. Among the great cities which it reaches are Montreal, Buffalo, Pittsburg, Detroit, Toledo, Cleveland, Chicago, Cincinnati, St. Louis, Milwaukee, St. Paul, Minneapolis, Duluth and Omaha. The lines included in the system are the property of many different corporations, some of which bear no relation of ownership, tenancy, or contract to each other, while in still more numerous instances the interrelations of the system are so complex as to render their description extremely difficult. In addition to companies wholly within their control, the individuals composing the Vanderbilt group of financiers can speak with a greater or less degree of authority in the management of several other important railway corporations, shares in the control of which are vested in some of the corporations which they actually dominate or in themselves as a compact, although unincorporated, body of business associates.

Table Showing Mileage and Relation to System

I. OWNED

Name of Co..	Miles Operated.	Relation.
N. Y. C. & H. R.	3,516.08	Prin. opr. and holding company.
Lake Shore	1,413.71	N. Y. C. owns 90.58% cap. stock.
Mich. Central	1,668.05	N. Y. C. owns 89.73% cap. stock.
C. C. C. & St. L.	2,529.67	Lake Sh. owns 29.55% cap. stock, giving maj. supposed to be owned by indiv. of Vanderbilt group.

Lake Er. & West.....	887.00	Lake Sh. owns maj. cap. stock.
N. Y., Chi. & St. L.....	523.02	Lake Sh. owns 50.06% cap. stock.
Ill., Ind. & Iowa.....	251.64	Lake Sh. owns 97.06% cap. stock.
Pittsb. & Lake Er.....	185.56	Lake Sh. owns 50.83% cap. stock.
Tor., Ham. & Buff.....	89.31	Contr. jointly by N. Y. C., M. C., Can So. and Can. Pac.
Det., Tol. & Mil.....	133.16	L. S. and Mich. Cen. each own one-half cap. stock.
L. E., Alliance & Wheeling.	61.00	L. S. owns all cap. stock.
Chi. & N. W.....	7,273.16	No corporate relation; controlled by common interests.
Chi., St. P., Minn & Omaha.	1,657.18	N. W. owns maj. of stock.

II. CONTROLLED

Phil. & Reading.....	1,003.33	Reading Co. owns subst. all.
Cen. Ry of N. Y.....	676.99	Reading Co. owns 52.91%.
15 other Cos. of Reading System	451.61	Reading Co. controls by stock ownership.
Del., Lack. & Western.....	947.81	No. corp. connection. Investing interests common.
Lehigh Valley	1,382.83	Lake Sh. owns 7.91% cap stock.
Nat. Docks R. R.....	8.64	Leh. Val. owns all cap. stock.
Hocking Valley R. R.....	347.00	Lake Sh. owns minority stock.
Ches. & Ohio.....	1,636.60	N. Y. C. owns 8.26% outstanding stock.
Pitts., Char. & Yough.....	20.59	Pitts. & L. Er. and Pitts., Cin., Chi. & St. L. control jointly.
Peoria & Pekin Un.....	18.14	C. C. C. & St. L. owns ⅛ cap. stock; Lake Er. & W. and N. W. also minor. owners.
Indianapolis Un. Ry.....	12.64	C. C. C. & St. L. owns ⅔ stock, Penn. rest.
St. L. Termin. R. A. Ass'n.	52.31	C. C. C. & St. L. own maj. cap. stock.

"The operating railways of the Vanderbilt system number thirteen, with the New York Central as the leader, although the railway mileage owned by this corporation is little more than 800 miles in length and wholly within the state of New York. This company owns all but 10 per cent of the Lake Shore and Michigan Central voting securities, and through the Lake Shore controls seven of the ten remaining companies. In addition, the New York Central is lessee and operating agent of railways by which its line extends to Boston, Montreal, Ogdensburg, Oswego, and the bituminous coal fields of Pennsylvania.

The president of the New York Central is also president of the Lake Shore, Indiana, Illinois and Iowa, the Lake Erie & Western, the Pittsburg & Lake Erie, the Detroit, Toledo and Milwaukee, and the Lake Erie, Alliance and Wheeling. He is also a member of the board of directors of the Michigan Central, the New York, Chicago and St. Louis, the Cincinnati, Cleveland, Chicago and St. Louis, and the Terre Haute and Burlington companies. The chairman of the board of directors of the New York Central is a member of the board of directors of the Chicago & Northwestern, the Chicago, St. Paul, Minneapolis & Omaha, the Cincinnati, Cleveland, Chicago & St. Louis, the Lake Erie, Alliance & Wheeling, the Michigan Central, the Lake Shore, and the New York, Chicago & St. Louis, and is chairman of the directorate of the last three. Out of a total membership of 141 in the directorates of the operating companies, ninety-seven, or 668.79 per cent of the memberships, are held by nineteen individuals who serve in from two to twelve boards each. Four hold forty-three directorships in the thirteen companies. The New York Central directorate cast eight out of the twelve votes in the Lake Shore board, nine of the thirteen in the Michigan Central, six of the eleven in the Cincinnati, Cleveland, Chicago & St. Louis, and six of the nine in the "Nickel Plate." Attempts to limit control in the Northwestern proved unsuccessful.

"The lines leased to the New York Central with mileage are: The Beech Creek Railroad, 159.69 miles; the Beech Creek Extension Railroad, 108.62 miles; the Boston & Albany, 304.57 miles; the Carthage & Adirondack, 15.85 miles; the Fall Brook, 91.51 miles;

the Gouverneur & Oswegatchie, 13.24 miles; the Mohawk & Molone, 182.22 miles; the New Jersey Junction, 11.77 miles; the New York & Harlem, 129.25 miles; the New York & Putnam, 56.83 miles; the Pine Creek, 74.96 miles; the Rome, Watertown & Ogdensburg, 409.69 miles; the Spuyten Duyvil & Port Morris, 6.04 miles; the Syracuse, Geneva & Corning, 64.27 miles; the Troy & Greenbush, 5.56 miles; the Walkill Valley, 32.88 miles; the West Shore, 478.97 miles; the Dunkirk, Allegheny & Pittsburg, 90.6 miles.

"The New York Central also operates one road, the New York & Mahopac, through the New York & Harlem, four minor roads through the Rome, Watertown & Ogdensburg as lessee, one road through the New York & Putnam as lessee, and five roads through the Boston & Albany, the eleven roads so operated having a mileage of 312.49. Under contracts other than leases it operates five short roads, with mileage of 28.78, and as agent operates five more, with mileage of 87.91.

"The valuation of the railway stocks and bonds carried on the books of the New York Central is $118,480,725.01, and the dividends received from shares of all kinds aggregate $4,507,139.60, or 4.07 per cent on the total par value, and 3.64 per cent of the value on the balance sheet.

"The New York Central has also absolute control of the Lake Shore road through the ownership of 90.58 per cent of its voting securities. The financial condition of the company and the liberal provisions of its charter give it great utility as a holding company for the other corporations of the sys-

tem. As operating company it directly manages 1,413.71 miles of railway, of which it owns in fee or through proprietary companies, 1,064.86 miles, or 75.32 per cent.

"The Lake Shore leases six lines, with a mileage of 348.85. The Lake Shore and the Pennsylvania, the latter through the Baltimore & Ohio, have jointly acquired $55,110,000 in par value of the $140,000,000 capital stock of the Reading Company. This means that the Lake Shore owns undivided half interest in $12,130,000 par value, first preferred, $27,980,000 second preferred, and $15,000,000 common stock of the Reading. The Reading Company is a holding company, owning a majority of the voting securities in the roads of the Reading system, including the Philadelphia & Reading Railway, the Central Railway of New Jersey, the Atlantic City Railway, and minor companies.

"The Michigan Central, the operating company third in importance, operates 1,668 miles, of which 326.71 are owned and 1,341.34 leased, including the Canada Southern, with 472.30 miles, covering branches and five leased lines.

"The Cleveland, Cincinnati, Chicago & St. Louis Railway operates 2,529.67 miles of railway. There are eight subsidiary railways with 759.40 miles.

"The remaining companies—the Lake Erie & Western, with 887 miles, the New York, Chicago & St. Louis, with 523.02 miles, the Indiana, Illinois & Iowa, with 251.66 miles, the Pittsburg & Lake Erie, with 185.56 miles, operate a number of smaller lines.

"The Chicago & Northwestern, and the Chicago,

St. Paul, Minneapolis & Omaha are regarded as belonging to the Vanderbilt system on the basis of ownership of a strong minority in voting securities, and the confidence of owners in the management. The mileage so operated amounts to 5,947.93 miles.

"The 20,188.56 miles of railway so far completely accounted for constitute the whole of what can properly be called the Vanderbilt system. Every mile of this aggregate is controlled by corporations in which the power of the group of financiers who dominate the system is at present and for all practical purposes absolute. This is not to say that in a very few of them conflicting interests are not represented by substantial holdings of capital stock, or that in any case the control now exercised may not hereafter be divested. Yet whatever may be lacking in these respects, and when all has been said, the sum is not much less than complete and permanent financial unification. These companies to-day constitute a compact and harmoniously conducted system."

"The relations between the Vanderbilt and the Reading systems are intimate, inasmuch as the New York Central has four directors on the board of the Delaware & Lackawanna, one on the Lehigh board, and is represented also on those of the New York, Ontario & Western, the Erie, the New York, New Haven & Hartford, and the Delaware & Hudson. The last four roads mentioned operate 5,554.23 miles of line. They are in no sense controlled or subject to the control of the Vanderbilt group of financiers, nor are they in any definable degree subject to influence therefrom; but the fact of common member-

ship with their common territorial interests, tends toward harmony of operations."

Sec. 56. Extent of Railroad Consolidation

The extent to which control of railroad corporations has gone on in America is well shown in the statement that 46 per cent of the 16 billion dollars of stock issued by railroad companies is owned by other railway corporations, while but 15 per cent of the bonds, amounting to $1,440,000,000, are held by railway corporations. Such widespread ownership of railway stocks and bonds is not alone for the purpose of investment. The holdings in the stocks of other railways has for its object either the control or the influencing of the management of the corporation whose operations are of real concern to the holding company. As has been indicated, these holdings are always sufficient to insure control; and even in the instance of the minority holdings guarantee of an effective influence in management evidently exists.

An extraordinary concentration of railway interests is now an assured fact in the middle Atlantic seaboard, and through it competition has been practically eliminated. The situation in the western and northwestern sections of the country has been brought to the attention of the public through the legal actions in the case of the Northern Securities Company and statements that were freely made regarding the holdings of Harriman, Hill and Morgan clearly indicate widespread control over railroad organizations. When one remembers that by one removal of a holding company from the prop-

erty actually operated, 26 per cent of the stock makes it possible for the holding concern to control the operating company, the importance of the decision of the Supreme Court in the case of the Northern Securities Company becomes markedly clearer.

Recent legislation by Congress (1920) providing for railroad consolidation only under the authority and control of the Interstate Commerce Commission promises to cure many of the evils of the past in this respect.

PART III

THE OPERATION OF RAILWAYS

CHAPTER I

GENERAL ADMINISTRATION

Sec 57. Types of Organization

The organization of a railway, especially one of the great modern systems, is as complicated as that of the federal government itself. It begins with the shareholders, who through the election of the board of directors delegate their powers, and from them it spreads like a fan into many departments and to thousands of individuals. In type it may be despotic, federal or coöperative. (1) The first of these designations, can be applied to the organization of a railroad which is under the domination of a great personality, which because of its control is able to remove men from their positions without carrying the matter through the immediate superiors of the person affected. It is despotic also in so far as policy can be directed through the control of the individual. "The tendency is toward the concentration of authority in one man; the effort is a sort of congestion at the periphery of which he is the center. Everything in the direction of progress and reform must be initiated by the head of the management. * * * It is not well for the heads of departments

to be confined to registering and executing the edicts of the responsible manager of the railway property. If this course be pursued, then the official head will be taxed beyond his individual capacity and the machine will not be at its maximum state of efficiency. It is this reservation by the central head of all power to originate charges, which is to be safeguarded against in the organization of great railway systems."* (2) The federal type of organization is one often seen; in it the division of labor is apportioned among many departments having specific heads. Officials on this plan of organization are given a good deal of freedom in the management of local affairs and are only constrained for the general good. It is in a measure a protest against too great uniformity under which individual judgment is given little opportunity. (3) The coöperation type is found in those companies where the railroad managers and superintendents consult with an advisory board, made up in part from their own members and from representatives of the board of directors. This form of organization has the advantage of creating harmony and a coöperative spirit among the different departments.

Sec 58. Method of Organizing

While these designations apply to the type of organization, the method of actually apportioning the division of labor to different departments is another matter. Ordinarily two forms are followed, which are known as the divisional method of organi-

*Haines, American Railway Management, p. 156.

zation and the departmental. To these two should be added a third, which is found in the combination of the two, as seen in a number of instances.

(1) The divisional organization provides for the breaking up of the mileage into convenient sections, which are termed divisions. In each one of these is a complete organization, beginning with the superintendent and going on down to foremen of trackmen. Over the divisions are general officers who communicate directly with the superintendents of divisions, and they in turn communicate with their staffs and the officers under them. It is contended that the divisional form of organization forces an immense amount of detail upon the superintendent in large systems, there must be general officers who give their time to the management of general matters, such as the movement of freight over the system as opposed to the division only.

(2) The departmental organization is described in some degree by its name. It is the kind of organization found in the division of labor, not on the mileage basis, but on the basis of the kind of work done. The department is, in the case of small roads, as extensive as the mileage. The difficulties of its workings at times are such as to create friction between different departments, because the conduct of the business is parallel rather than perpendicular.

(3) The advantages of the two methods have brought about a combination, where in some instances the department organization is as broad as the mileage, and in other instances the operation of the road is carried along divisional lines. It would be difficult to use the divisional organization in its

entirety since some of the departments must have knowledge of conditions over the entire road. Thus there is no divisional treasurer, since one can do the work more satisfactorily as a system department.

Sec 59. Division of Work in Railroad Organization

The president of a railroad is the connecting link between the board of directors and the working organization. His duties are general in character, largely supervisory, and under the general policy of the board of directors he attempts to carry on the business of the railroad. With him are associated in most cases a number of vice-presidents who are at the head of the great departments of the railway. Speaking generally, the work of a railway company is divided into some six divisions. These are: first, the general office, where the receipt and expenditure of money,—the accounting, the auditing, the purchases, and matters relating to the entire road are taken care of; second, the operating department, under the direction of which trains are moved and traffic carried on; third, the maintenance of way and construction department, the officers who have this in charge being expected to keep up the railway and carry on the construction of bridges, new lines, and buildings; fourth, the traffic department, in which is gathered the work of extending the business of the road and getting freight, developing the movement of passengers and establishing relations with shippers; fifth, the legal organization, for every well equipped railroad has many legal matters to pass upon in the everyday operation of its lines and in the development of its policy; these matters require the

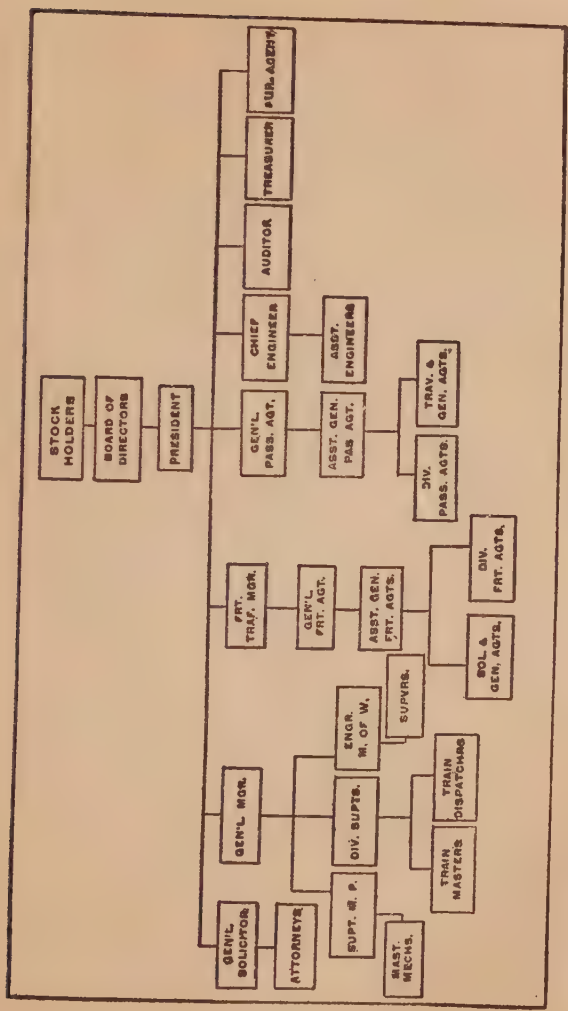
attention of trained men in the law, and sixth the division in which the supervision of miscellaneous matters is placed, such as the care of real estate, the sale and acquirement of land, matters of pension and relief, insurance, etc.

The tendency in all railroad organizations seems to be toward centralization of administration. This is seen even in the development of buildings. The railways now either own or lease their own buildings which are devoted to the housing of the general offices. It has been found further that it is practically necessary to provide a supreme authority at all points where action must be taken, and that in connection with this condition it is essential to outline carefully and thoroughly the authority and responsibility of positions, while at the same time conforming the duties to the capacities of those who are to occupy the places. Railroads have learned also that it is wise never to subordinate an individual to two or more persons, but rather to put him under the direct control of one individual who is responsible for his work. As the lines have developed, the necessity of discipine, of order, and of conscientious adherence to duty are more and more impressed upon the managers of great railways, and the tendency is markedly in the direction of centralizing the authority rather than localizing it. There is danger in either direction when carried to the extreme. Where large local powers are given to superintendents lack of harmony of action is likely to result; while, on the other hand, elasticity and thorough knowledge of the conditions in a community are apt to be less if the centralization is too great. The railroads have at-

tempted to avoid these extremes, as is clearly shown in the instance of the roads whose plans of organization are shown in the accompanying charts.

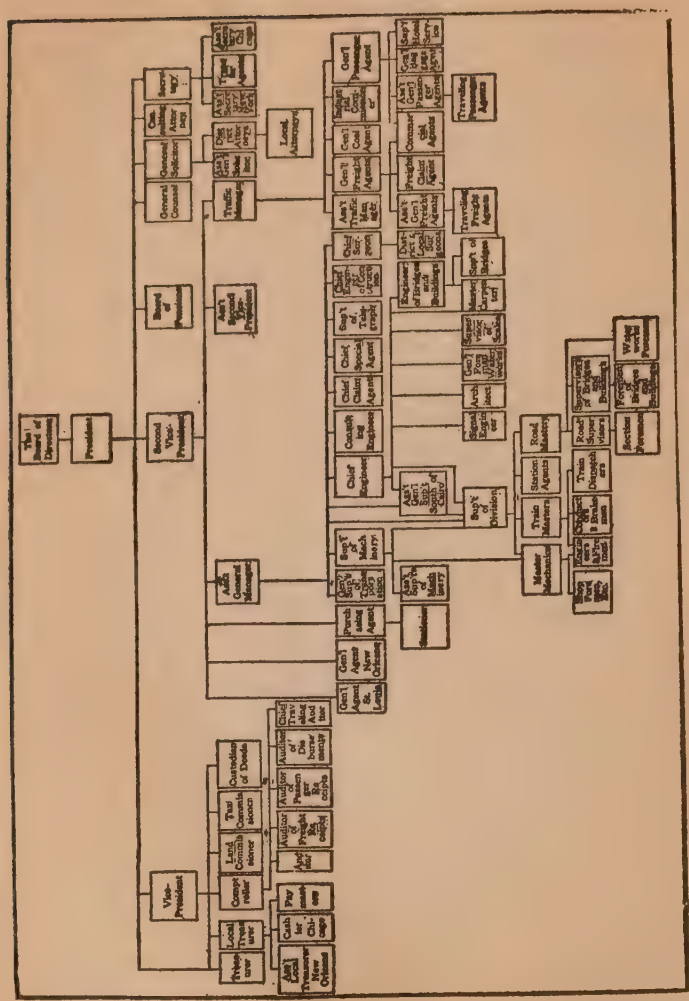
Sec. 60. Examples of Railroad Organization

The Chicago & Alton road is a comparatively short line, and under its organization the president deals directly with the general solicitor, general manager, and traffic manager, the chief engineers, auditors, treasurers and purchasing agents. The division superintendents are responsible directly to the general manager, both in the matter of movement of traffic and of the maintenance of way. In the case of the Illinois Central a different type of organization is to be seen, in which the power of the road is concentrated under a few heads. It is thoroughly organized on the legal side, with general counsel, solicitor and consulting attorney, who are either cooperators with or individually responsible to the president. The road's organization calls for two vice-presidents. The first vice-president has direction of the work of the treasurer, the comptroller, the auditor, the land commissioner, etc. The second vice-president is assisted by the assistant general manager, an assistant second vice-president, and the traffic manager. The assistant general manager has charge of the movement of transportation, of motive power, and the maintenance of way; while the traffic manager has charge of the freight agents, passenger agents, and the superintendent of hotel service. The superintendent of divisions in the case of this road is responsible to department heads. Thus he is affected



From "System."

Organization Chicago & Alton Railway.

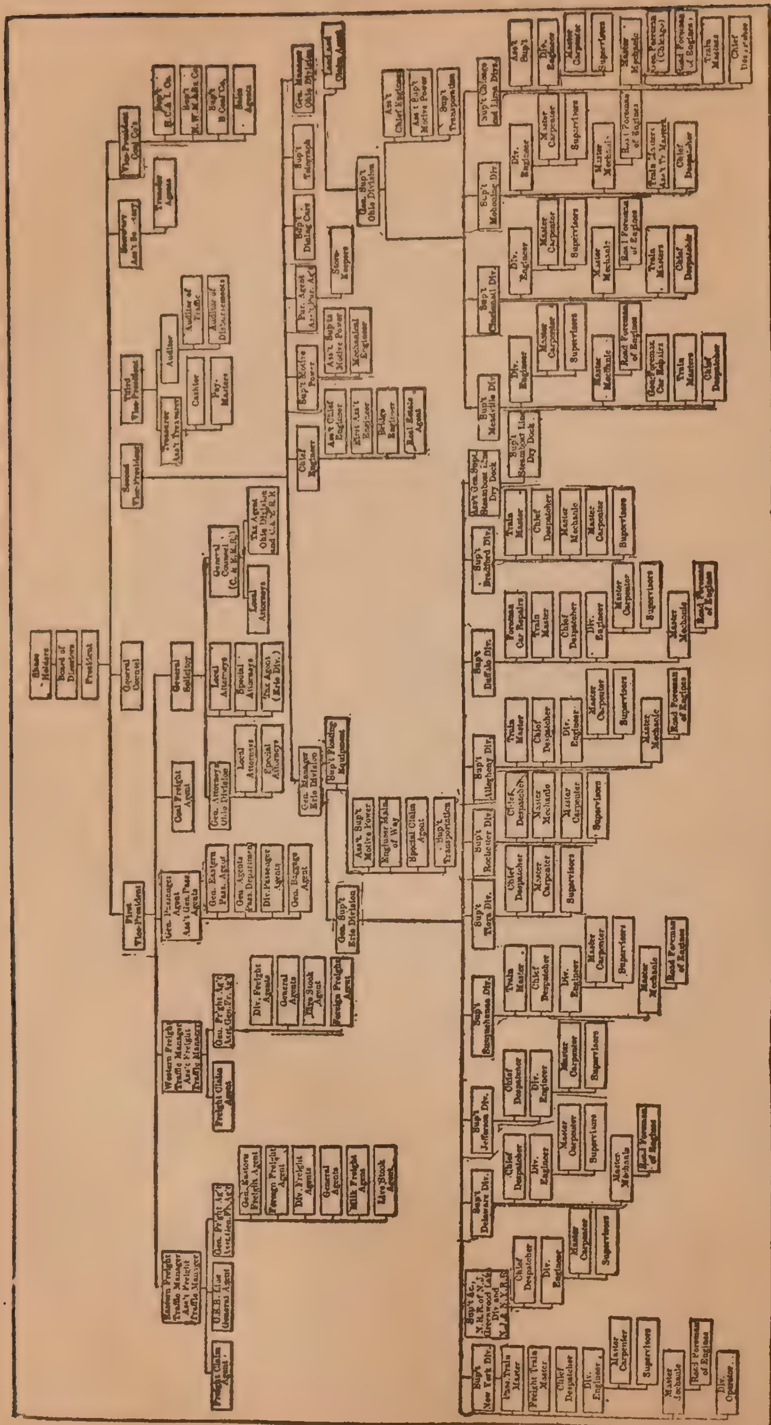


Organization of the Illinois Central Railroad.

From "System."

by the departmental organization in that he must report to the general superintendent of transportation, of machinery, the chief engineer, and the assistant superintendent, in case his division is south of Cairo.

The Erie Railway is described in many of the magazines and articles as a road elaborately organized, with authority focused in the president of the road. The four vice-presidents have charge (1) of the freight and passenger department, (2) of the direction of the Erie & Ohio division chief engineer, superintendent of motive power, superintendent of dining cars, telegraph superintendent, and purchasing agent; (3) of the treasurer's and auditor's departments and transfer agents; and (4) the direction of the coal companies, whose business is a large factor in the Erie's organization. The Erie Railroad in its organization has divided its mileage into two general divisions, known as the Ohio and the Erie. Over these general superintendents preside, with, in the instance of the Erie division, an assistant general superintendent of marine service, and in the case of the Ohio division an assistant superintendent at Chicago. Each general division has a general manager, who is under the direct supervision of the second vice-president. The actual direction of the work of the road is in the hands of the fourteen division superintendents, to whom report the usual officers, such as dispatchers, engineers, master mechanics, etc. The general counsel of the road is in direct association with the president and on the same standing as the vice-president. The general solicitor reports to the first vice-president.



Organization of the Erie Railroad.

From "System."

Railroad men usually regard the organization of the Pennsylvania Company as one which shows clearly the plan of subdividing authority rather than of concentrating it. The road has three vice-presidents in charge respectively of traffic, accounting and auditing operations, and maintenance. A general manager associated with the third vice-president in the operation of the road has general supervision over the movement of trains and maintenance of equipment. He is assisted by five general superintendents, who have charge of general divisions. Under the general superintendents there are thirty other superintendents, and in each of the divisions are the different assistant officers, such master mechanics, division operators, trainmasters, foremen, and the like. There is also a superintendent of motive power and a master mechanic under the general superintendent of each of the five divisions.

[Note.—Since the above was written the organization of the Pennsylvania has been changed to a regional system.—Ed.]

Sec. 61. Divisional Officers

Taking at this point the office of general superintendent for some further discussion, it will be found that each general superintendent has a staff which assists him in the supervision of the road under his charge, in the movement of trains, the maintenance of way, the repair and building of equipment, and in the securing of traffic. A division of the railroad is usually about one hundred miles, varying from 80 to 150, according to the density of traffic and the general conditions along the line. As has been said before, such a division is under the direction of the superintendent, through whom all matters relating to the division pass, whatever they

may be, except in the case of roads where a departmental organization exists. In such cases departments may be organized which have charge of equipment or of the movement of transportation. Where this is true the division is merely a branch of the department, but usually the division superintendent has the complete organization under his direction and control. These officers may be listed at this point:

The Division Engineer is in charge of the right-of-way, and has under his direction the road masters, master carpenters and laborers.

Assistant Division Engineer. Each division usually has at least one competent assistant engineer. He should be a man of practical experience, able to look after all work during the absence of the division engineer, superintend any structure, make surveys, and do any work the division superintendent or division engineer may require.

The Track Supervisor reports to the division engineer, and he has charge of such number of miles of road as will enable him to give personal supervision to all important work on the part of the road of which he has charge. Each part of road so divided is numbered and known as a district.

The Track or Section Foreman is under the direction of the track supervisor. He has charge of a section, depending on the number of tracks and the traffic, which should not be too large to be properly cared for. He also has charge of the extra gang foremen when such are necessary.

The Water Supply Foreman reports to the division engineer direct. He has charge of all water

stations within certain well defined limits. He also keeps up repairs and sees that all stations are supplied with fuel, and that pumpers are on duty and water always ready for engines.

The Foreman of Structures must be a competent man in charge of a gang of skilled carpenters, there being one such gang for each division, whose duty it is to keep in proper repair all buildings. Under him also is the bridge foreman, with a gang of carpenters and laborers to repair all bridges and trestles, and the foreman of masonry, with a gang of masons and helpers.

These all report to the division engineer. Next in importance to the engineer is the master mechanic, who has charge of equipment. This officer is assisted by a road foreman of equipment and an enginehouse foreman, to whom the enginemen and firemen and the car inspectors report. The trainmasters are in charge of the train service, both freight and passenger, and with them are associated the station masters, to whom all passenger conductors, track men, freight conductors, brakemen, switch tenders, lever men, yardmasters, and baggage men report. The director of the actual movement of trains is the chief dispatcher, and to him telegraph operators, train dispatchers, and linemen report. The supervisor of roadway has under his direction the track foremen, watchmen and bridge tenders.

The detail of railroad organization and employee's work is instanced in the case of a freight conductor, who is required before taking his train from the terminal to check initials and numbers of all cars and in case of broken seals to examine the

contents of the car, for the purpose of comparing them with the bill of lading. When this task is completed, he reports to the yard office and examines the train book, for the purpose of checking the cars which compose the train. As the train proceeds, records are kept of cars set off and freight taken on. At the divisional point the yard master receipts for the remaining cars. The report of car movement is sent to the car accountant, and from the movement the mileage record is made.

Under the tonnage system of locomotive rating, the engineer reports to the enginehouse foreman the figures for the performance of his engine on its trip. If he fails to pull the rated tonnage, it is either because the locomotive is out of order or because he cannot operate the engine. From the roundhouse records the master mechanic has a means of checking engine ratings with actual performance. (See Chapter III, Part III.)

Each of the officers and employees of a railroad is expected to make a report to his superior, and the superior officer turns in a statement to the superintendent of the division. These reports are regular, occasional, and special, and when grouped come under the heads of maintenance, motive power and equipment, construction, passenger department reports, freight department reports, and general reports. According to the summary of employees presented by the Interstate Commerce Commission for a recent year there were 1,672,074 persons employed by the railway companies. This number on the basis of each 100 miles of railway would be 735, an increase of nearly 50 per cent over that of

1901. The complete classification for the year mentioned above is given in the table below:

Class—	Number.	Per 100 miles of line.
General officers	6,407	3
Other officers	7,549	3
General office clerks	65,700	29
Station agents	35,649	16
Other station men	152,929	67
Enginemen	65,298	29
Firemen	69,384	31
Conductors	48,869	22
Other trainmen	134,257	59
Machinists	55,244	24
Carpenters	70,394	31
Other shopmen	221,656	97
Section foremen	41,391	18
Other track men	367,277	162
Switch tenders, crossing tenders and watchmen	53,414	23
Telegraph operators and dispatchers	39,193	17
Employees—account floating equipment	9,139	4
All other employes and laborers	228,324	100
Total	1,672,074	735

Discussion often arises as to whether railroads should buy or manufacture their supplies for repairs, when these can be purchased in the open market. In determining the cost of actual manufacture by the road, railroad managers are apt to forget that freight should be charged on the raw material, and that cars used for such purposes might have been operated for paying freight, and in consequence have earned general expenses and interest. On the other hand, the shop capacity of most roads has not increased in proportion to the business, so that extra work, outside of limited repairs, crowds the shops

and increases the cost of the work. Articles used by railroads, where they are of a special character, can be made more economically by special firms. In most instances the companies have begun the manufacture of parts for the purpose of forcing down the price. This has succeeded, and competition today makes it possible to buy more cheaply than to manufacture. It is also a question as to whether railroad companies can afford to keep up with the times in the purchase of the latest machinery, tools and equipment, and if this is not done, the cost of production is increased, and it takes a longer time to turn out the work. The ordinary manufacturing plant is practically refitted every ten years. There is no question, however, that it pays railway companies to do some manufacturing in order that they may keep good men at work during dull times and maintain their shop organization throughout the year. In some cases railroads extend the principle of doing their own work to construction, and place in charge of the chief engineer all of the building and laying of tracks. In other cases the roads have their operating department put in bids in competition with other contractors. If the contractor's bid is lower, he gets the job, but if it is not the railroad constructs its own right of way. It is necessary, however, where such enterprises are carried on by the railroads, that the bookkeeping and accounting system shall be unusually well developed, in order to check the wastes that are likely to occur.

Sec. 62. Requirements for Admission to Railroad Service

Coincident with the growth of the railway in mileage, in capitalization and in density of traffic have been the increased requirements for admission to the railway service. This is especially marked in the demands made by the companies for young men in good health and of good habits. As an example of this statement is the fact that the railway will not take for the position of fireman a man under twenty-one or over twenty-seven years of age, and his condition,—health, eyesight and hearing,—must be the best, his habits free from dissipation, and his education sufficient to make him capable of understanding directions and orders. It is the policy of most lines to promote men to positions above from the lower ones. Thus, enginemen are selected from firemen, conductors from brakemen, station agents from telegraph operators and clerks. In very few instances have the railroads as yet awakened to the wisdom and necessity of educating and training their men to larger efficiency. "A railroad system properly organized has its staff, field and line officers, its supply departments, its inspectors, its divisions, and its districts of operation; in a word, it is an army whose office is to stay; not to devastate but to transport the people and products of a country. This is its function, and to this end all of its efforts are directed; and to accomplish this end successfully discipline is as essential as in a military organization. * * * This discipline should be really a teaching or training for those who are to enter upon the work.

There should be preliminary examination for physical, mental and moral suitability; physical examination to discover serious defects unfitting men for work; some test of knowledge in ordinary school branches, and of honesty and sobriety. The flagman, the telegraph operator, the fireman should be able to see and to hear, to read and to write, to keep sober and to tell the truth, and it is due to the public they serve, and to the employers with whom they serve, that their ability to do these things should be tested before they are tried in actual service and found wanting. Knowledge of train rules is a prime requisite, and proficiency is necessary for advancement. Examinations and records should be kept of ability, accidents avoided, etc. *Esprit de corps* must be developed among the men. This is the spirit which impels the flagman to go back in snow or rain to stop an approaching train instead of lurking in the rear of the caboose, which nerves the engineer to stand at the throttle lever when danger is impending rather than leap for life and leave his passengers to their fate. This is the spirit which results from training mind and body to do the right thing at the right time, that true discipline which is the foundation of efficient service."*

Public opinion should place blame where it belongs in case of accident,—on violated train rules; and the men who are guilty of this should be held responsible for murder; employes who neglect duty should be liable to the courts.

In Europe this technical education has been de-

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*Haines, American Railway Management, pp. 8, 13.

veloped very considerably, and here and there American lines as in the instance of the Chicago, Burlington & Quincy, the Reading, the Lehigh, the Santa Fé, the Great Northern and the Northern Pacific, have made attempts to give some instruction in the duties of the different positions. The Santa Fé Railway, in particular, found itself a few years ago in the position where it had two men only who could fill a foremanship in charge of the work of repair shops, and one of these was not especially well adapted by temperament, so that the road was in a measure at the mercy of an employe. In consequence of this situation, the road began to develop a school of apprentices, which was put under the direction of a man who had been trained in the public school system and who understood educational methods. In many instances the companies encourage their men to take work in correspondence schools or in local Y. M. C. A. night schools, but outside of occasional conferences or short time correspondence school courses very little is done on the part of the railways to educate their men for the work that they are doing except through the experience of everyday labor.

Sec. 63. Pensions, Benefits and Bonuses

Continuance of employment, both from the standpoint of the railway and that of the men, has been considered as highly desirable, and in the endeavor to better the personnel of the service and retain employes for long periods of time, the railway companies have organized pension systems or established premium payments in shop work, or permitted the

men to purchase stock on advantageous terms. The Baltimore & Ohio in 1889 organized the first railway pension system in the United States, and the Pennsylvania Company in 1900 the second. The Illinois Central also has a pension plan which illustrates the principle of organization. Under this plan, men sixty years of age who are incapacitated, or men who are over sixty-five years of age who have been in the service ten years, receive an annual pension of one per cent of their monthly salary for each year of their service. Besides the pension system, some of the roads have granted employes the privilege of purchasing stock on advantageous terms. Amounts are deposited from time to time, and such deposits bear a three or four per cent rate of interest. When an amount equal to the agreed upon price of the stock has been accumulated, the share is transferred to the employe. This method of securing a larger interest in the affairs of the company has been carried on by the Illinois Central in particular and recently has been adopted by the Great Northern Railway, which has organized a concern known as the Great Northern Employes' Investment Association, Limited The shares are purchasable through a certificate plan, upon which seven per cent interest is payable by the company.

Recently the Santa Fé Railroad Company issued circulars to employes suggesting the buying of lands, the purpose being to "encourage thrift and assist employes to accumulate something." The price of farms in Texas is still very low, but constantly increasing. Employes are strongly advised to purchase farms as a sure investment, and the company

presents an elaborate plan for aiding them, by meeting the instalment notes. The employe is to select the land, make a bargain with the owner, have a lawyer examine titles and take care of the papers, then turn over the title, making payments to the company in such instalments and for such time as he likes, giving the treasurer of the railway company the necessary authority to deduct monthly payments from the buyer's wages. The company is benefited by having a larger proportion of its employes who possess an interest in the country and wish permanent employment. It is hoped to change the large class of "floaters" who move from road to road, saving nothing and having no hope for the future, and transform them into land-owning citizens with a home for old age.

In 1901 fourteen reading rooms were established on the Santa Fé, seven east and seven west of Albuquerque. "The privileges of these reading rooms consist of all the latest books, all the leading periodicals of the country, baths, games of all kinds; lectures are also provided by the eminent educators of the day, on social and scientific subjects,—lectures on astronomy, chemistry, geology, physiology, sociology, and kindred topics. These privileges are absolutely free to all employes and their families, and the community in the smaller towns has always been invited and welcomed. More than 10,000 books are in circulation on the Santa Fé system."

An increasing number of railways have established employes' relief departments in the last fifteen years, the purpose being to solve the labor problem. Railway employes may obtain insurance from three

sources: (1) from accident or life insurance companies; (2) through membership in a brotherhood or union; (3) through the relief department of the employing company. Until recently the first method was the most in vogue, and the second next. The type of organization shown in the employes' relief department was copied partly from the Employes' Accident Insurance Association of the Grand Trunk Line, founded in 1873. The conditions imposed upon the employes who are eligible to this fund are usually that they shall be less than forty-five years of age and able to pass a satisfactory physical examination. The funds are derived from the contributions of members, an appropriation by the company for the expense of management and administration, and from the interest of funds set aside by the company. The monthly contribution of employes ranged from 75 cents to $7, according to the wages, class and amount of benefit. The members contributing to the relief fund are entitled to free surgical attendance and a certain amount of relief pay during a period of sickness.

The pension systems established by railway companies are based on a careful study of European plans, though modified so as to adapt them to American conditions. In the case of the Pennsylvania Company a certain sum is set aside to meet the conditions of the Pennsylvania list. Over one thousand persons were on the list the first month. Under the plan adopted by this company, the employes receive an allowance from the relief fund association, which may be as high as $8.35 per month. When this is

combined with the pension allowance the resulting sum is estimated to be about three-fourths of the pay.

In many of the railway companies accident and benefit insurance have been established, which varies in accordance with the salaries of the men employed. Payments are made in the case of sickness or of disability, and the company calls upon the men for the payment of so much per month, which varies with the amount of the salary. All of the railway companies maintain corps of surgeons and have usually at division points hospitals or hospital equipment where men who are injured or are sick may be taken care of.

In the shops where high grade mechanical labor is employed, a number of the roads have found it desirable to encourage greater efficiency by the stimulus of extra pay. Two methods in particular have been followed, one known as the premium system, and the other as the gain sharing system. The premium system is based upon a normal standard of work on certain kinds of tasks. Against this normal standard is placed a fair payment on the hour basis. Any employe who can furnish the work in a shorter number of hours than normal, providing the work is accepted, receives a premium. This system encourages great and constant effort on the part of the employe. The gain-sharing system differs in this respect, that any gain which is secured by the careful use of machinery, material and time over the usual cost is divided between the company and the men doing the work.

With the rapid development of the railroad has come the trade union and kindred organizations among the employees of the railroad. Outside of one or two instances the organizations are confined to the operating side of the business. The oldest unions are the Brotherhood of Locomotive Engineers, 1863; Order of Railway Conductors, 1868; Brotherhood of Locomotive Firemen, 1873, now combined with the Enginemen and the Brotherhood of Railroad Trainmen, organized in 1883. The purpose of the unions is to secure a satisfactory wage scale, hours of employment and appeal of grievances. These objects at once raise an issue between personal management and management by trade agreement and where accepted in its entirety establishes a dual management, since the manager does not possess full authority of dismissal under the agreement. The membership of these unions numbers over 300,000.

It is impossible to deal with the organization of a railway company in one chapter or even in a book by itself. What has been set forth in these pages is a general outline only of the plans of organization usually followed and of the relations of some of the principal officers to each other. The reader who desires more detail relative to the organization of companies is referred to such books as Byers' "Economics of Railway Operation," Hoff & Schwabach's "Official German Report of American Railways," Wellington's "Economic Theory of Railway Location," and McPherson's "The Workings of Railroads."

CHAPTER II

MAINTENANCE OF WAY

Sec 64. The Basis of Modern Railway Construction

The passage of forty years has seen a remarkable change in the point of view regarding railway construction. In the earlier days the emphasis was placed upon the reaching of towns by new lines and the frequency of trains. Today railway managers seek straight lines, low grades, and a decrease in train mileage. The argument two score years ago was based on the necessity of finding traffic, of getting to the towns easily, and with low cost of construction. In contrast to this, the emphasis in present construction is upon density of traffic and larger tonnage to each train. The attempts at improvement and reconstruction of railroads have all been in the direction of enlarging the efficiency of the line as a traffic carrier, and the desire has been to increase the size of the trainload, and to earn money as a consequence through the decrease in the number of train miles. The change that has taken place in the principle of operation as indicated by this statement is clearly shown in the table given on the next page, covering a recent period of twenty years.

RAILROADS OF THE UNITED STATES

Year.	Miles Operated.	Freight Train Miles. Total.	Freight Train Miles. Per Mile.	Ton-Mile Freight Handled. Total.	Ton-Mile Freight Handled. Per Mile.	Rate per T-mile.	Tons per Train.	Cents.	Appear.
1882	95,752	305,118,035	3,187	39,302,209,249	410,458	1.236	129		
1885	122,210	342,288,770	2,808	49,151,894,469	402,192	1,057	144		
1890	157,976	482,900,422	3,056	79,192,985,125	505,095	.93	165		
1895	177,746	449,291,238	2,527	85,227,515,871	479,490	.839	189		
1900	192,556	492,543,526	2,558	141,596,551,161	735,352	.729	271		
1905	216,975	546,424,405	2,519	186,463,109,510	861,396	.766	322		
1906	222,340	594,005,825	2,672	215,877,551,241	982,401	.....	344		
1907	227,454	629,995,723	2,769	236,601,309,103	1,052,119	.759	357		

Upon examination of this table it will appear that since 1882 the freight train mileage decreased from over 3,000 miles to each mile of operated line to less than 2,800, while, on the other hand, the number of ton miles for each mile of line operated increased from 410,000 to over 1,000,000. The same story is told in the figures regarding the number of tons per train. A train carried on the average only 129 tons of revenue tonnage in 1882, and this had increased to nearly three times that amount in 1907, the figure then being 357 tons.

In this same period of twenty years referred to above a strong reaction had taken place against the tendency towards expansion and new construction. It was necessary, in order to learn this lesson, that the railroads of the United States should be forced to pass through a period of economy and hard financial conditions, even to the point of many receiverships. Compared with the existing mileage, new construction goes on actively enough, but it is very moderate as compared with the building of earlier days. This policy of expansion has now given place to one of betterment and railroads are today invest-

ing large sums in track and equipment, so as to increase the trainload as much as possible.

Sec. 65. Grade Reduction

The emphasis of railroad managers is now given to the reduction of grades. It is but recently that a continental trunk line erected what is called a high line around a town in a western state. For many years the road had been dragging its trains in and out of the town over heavy grades to the tracks above. This caused an additional cost of operating the trains of not less than $25,000 a month on this one section alone, besides delaying greatly the traffic movement. The improvement cost about one million dollars, but it is said the road will receive enough benefit in the way of lowered cost and larger tonnage to pay interest and principal in seven years. The new high line is a continuation of the railway on both sides of the town at the same grade, and further west on the same railroad an extension is now being built through the Bad Lands for the purpose of securing a lower grade and more nearly a water level route than exists on the present line. The Chicago, Milwaukee & Puget Sound road built recently to the coast has every variety of improvements to decrease grades wherever expedient with capital cost. The cost of the road, while much greater than if built on a different policy, will nevertheless be quickly made up by the increased earnings and lower cost of operation. The construction work of the present day, by the use of steam shovels, track-laying machines and the like, is much cheaper in many respects than in the days when roads were first built, although ties, rails, right

of way, and labor are more expensive. The keeping of the grade to the lowest possible point pays larger returns, as is shown by the fact that on a 100-mile division the decrease in expense would amount to not less than $54,429, which, if capitalized at a five per cent basis, would mean a saving in capital of over $1,000,000. This statement is based upon the supposition that there is but one train each way per day.

A writer upon this topic of grades stated some time ago that "discipline and technical training have brought the generality of railroad operations up to a high degree of efficiency, but the practical working out of grade economies has not, as a rule, been attended to with the same degree of skill and completeness. This is not because the matter is complex, for it is essentially simple; but it is of a nature outside the tactics of railroading which discipline and skill have perfected. It belongs to the higher sphere of management, where success makes requisition alike upon individual initiative, coöperation of directors, good credit and favoring circumstances. The comprehensive reconstruction of a railroad falls after all within the day's work of comparatively few men. Of these still fewer have the free hand and the sense of proportion to work out their improvement policy, even for a moment, into a well-appointed whole." Any railroad might easily absorb an unlimited amount of capital in improvements before it could be brought to perfect physical condition. Under old calculations improvements might have been carried to where a yield of six or seven per cent would have resulted, but under new conditions, where traffic is more concentrated, the same improvements,

carried perhaps to a somewhat further degree, would yield to-day nine or ten per cent. In most roads there is a section or two which because of its peculiar imperfections limits the number of trains as well as the amount of the traffic. It is by no means rare to find some heavy grade in a railroad that requires the breaking of trains and the low rating of locomotives in order to make it possible for them to drag their load up the grade. Railroads that have relied solely upon their original investment are placed at a great disadvantage in spite of low capitalization, when compared with roads that have constantly made improvements in their roadbed, grades, locomotives and cars. It is for this reason that roads like the Southern and the Erie, which, while endeavoring to improve themselves, have not invested a sufficiently large amount of capital to bring the roads up to modern conditions, do not reap the largest results. On the other hand, roads like the Pennsylvania, the Union Pacific, and the Great Northern have been practically reconstructed, and they are now in a position to get out of the prosperity in the territory through which they pass the largest measure possible. Their position is constantly strengthened, both as a carrying road and as a financial going concern, because of their ability to keep up with the demands made upon them for the movement of traffic.

Sec 66. The Cost of Railroad Construction

Mr. John F. Wallace is an eminent authority upon the building of railroads and the conduct of engineering enterprises. In an article in the Engineering

Magazine* he has set forth the fundamentals of the cost of railroad construction, and so well has the matter been put in a comparatively short space that nothing better can be done in this section than to restate his opinion upon that point:

"The factors which determine the cost of railroad construction are varied, and are affected by local influences and time conditions. Railroads have been built across the prairies and the states lying between the Alleghany and Rocky Mountains that did not involve a cash outlay, including equipment, exceeding $15,000 per mile. On the other hand, trunk lines have been built between important cities, some sections of which have cost as much as $100,000 per mile.

"Railroad construction in the United States might properly be divided into three distinct classes, as follows:

"First: trunk line construction,—that is, construction of lines between prominent cities, with every detail up to the standard of American trunk-line railroads. The average cost per mile of a line of this character at the present time (1895-1896) would be approximately as follows:

Right of way	$ 2,000.00
Bridges and culverts	4,000.00
Graduation	12,000.00
Ballast	3,000.00
Track material and laying	7,000.00
Fencing	400.00
Telegraph	250.00
Water supply, station buildings, roundhouses, etc	1,200.00
Engineering	700.00
General and legal expenses	600.00
Proportion of terminals	5,000.00
Equipment	4,000.00
Total	$40,150.00

*"Cost of Railroad Construction." John F. Wallace; Engineering Magazine, Vol. 10, p. 472.

"East of the Mississippi valley this estimate would be increased by additional cost, under such items as right of way, bridges and culverts, graduation, etc. West of the Mississippi valley, in the mountainous country, the cost of bridges, culverts and graduation would be increased in the construction of long trunk lines, and the cost of terminals would be diminished. This sample estimate, however, will fairly show the average cost of the ordinary trunk line in the central portion of the United States. To this amount should be added the cost of financeering, which is usually not taken into account in estimates of this kind; experience in railroad promotion has shown that new lines necessarily have to dispose of their securities at a discount, whereas interest has to be paid on the face value. A discount of 10, 15 or 20 per cent on the bonds of an enterprise of this kind is not unusual, which would increase the above cost to approximately $50,000 per mile.

"Second: main lines of roads which do not form parts of through trunk lines, but which connect towns and cities of secondary importance, and upon which alignments and grades can be adopted that will admit of economical construction. A sample estimate of the average cost per mile of a line of this character, under present conditions, would be substantially as follows:

Right of way	$ 1,500.00
Proportion of terminal	1,500.00
Bridges and culverts	2,500.00
Graduation	6,000.00
Track and laying	6,500.00
Ballast	2,500.00
Telegraph	250.00
Fencing	400.00

Water supply, station buildings, roundhouses, etc.	800.00
Engineering	500.00
General and legal expenses	400.00
Equipment	2,500.00
Total	$25,350.00

"Third: branch lines,—that is, lines tributary to existing railroads, comparatively short, whose function is simply to bring passengers and freight to junction points with main lines, to do which two passenger trains and possibly three or four freight trains daily would fulfil maximum requirements; lines on which also, heavier grades and sharper curves can be used, where desired, in order to lessen the cost of construction without materially increasing the cost of maintenance and operation. The average cost of a line of this character would be about as follows:

Right of way	$ 1,000.00
Proportion of terminals	500.00
Bridges and culverts	1,500.00
Graduation	3,000.00
Track and laying	6,000.00
Fencing	300.00
Telegraph	200.00
Water supply, stations, roundhouses, etc.	500.00
Engineering	400.00
General and legal expenses	200.00
Equipment	1,500.00
Total	$15,100.00

"We may now consider the different items in detail.

Right of Way.—The value of a right of way depends, of course, on local conditions. For a single track branch railroad, in a comparatively level country, from 50 to 66 feet may be sufficient. On a low-grade trunk-line railroad, with high embankments and deep cuttings, with the probability that second and additional tracks may be needed later, from 100

to 200 feet is generally required, and at important embankments and cuts still more. In the construction of lines across prairie country, where the building of the road will be of more or less local benefit, donations of right of way are frequently made, or the prices modified. Under ordinary circumstances, however, the average cost of right of way will be substantially double the usual local market value of the real estate. But when it is necessary to secure the right of way in a thickly settled portion of the country already under cultivation, and well supplied with railroads, and where the property is cut diagonally, it is frequently necessary to pay four or five times the ordinary local value of the real estate actually occupied by the right of way; and it is sometimes necessary to purchase more land that is actually required, in order to make satisfactory settlements. It is true that the right of condemnation can be and is frequently utilized, but this mode of obtaining possession restricts the use of the property to railroad purposes. The best railroad managers prefer a deed in fee simple.

Bridges and Culverts.—The cost of bridges and culverts will, of course, depend upon the local physical character of the country the line traverses, and upon the character of construction which the engineer in charge may determine upon.

Graduation.—This item also is entirely dependent upon local physical conditions; the cost may vary from $1,000 or $2,000 per mile in prairie country and on branch lines where low grades are not essential, to many thousands of dollars per mile for main line

construction in rough country and where solid rock may be encountered.

Ballast.—This item will vary from a few hundred dollars per mile for branch lines, where the ordinary soil of the country is frequently used for this purpose, to $1,000 to $2,000 per mile for gravel, according to the proximity of the gravel pits, and to $2,000 to $3,000 per mile for rock ballast, according to the proximity of the quarries.

Fencing.—This item is small and substantially uniform, regardless of the classification of the railroad, but is dependent upon local requirements, different states placing various interpretations upon the term legal fence.

Water Supply, Station Buildings, Round-houses, Etc.—This item, of course, varies largely with the classification of the road, the character of its business, and the ideas of its management as to what is proper and necessary.

Engineering.—The cost of engineering, while comparatively a small item in itself, frequently affects the cost of the other items materially. The money appropriated for this purpose is supposed to be spent in securing the best available talent, which is expected to determine the most economical means of accomplishing the purpose for which it is engaged, viz., the location and construction of a line of railroad which will be able to handle the greatest amount of business for the minimum of outlay, this outlay including, of course, interest on cost of construction, plus maintenance and operating charges. The cost of engineering is influenced by the ideas of

the management, as well as by the ideas, economical or otherwise, of the chief engineer.

General and Legal Expenses.—These vary, according to the personal qualifications and business ability of the promoters, from a small amount per mile for branch lines to the large amounts necessary in securing the construction of a line through a well-settled country, and particularly terminal facilities in large towns and cities, and in settling the complications and litigations that arise in negotiating with other railroads for connections and crossings.

Terminals.—This element of expense is affected greatly by local conditions in the city where the terminal is situated.

Equipment.—The cost of equipment depends not only on the character of the line, but also on the volume of its business.

"Having touched upon the variations in the cost of the different items of railroad construction, due to local circumstances, it is now proper to mention the variations in cost that are due to time conditions, i. e., the variations in the cost of different items from year to year, as the result of the general development of railroad construction.

Right of Way.—The cost of right of way is continually increasing year by year, as the country becomes more settled and land consequently rises in value, and as the feeling of the necessity for additional railroad facilities diminishes in the minds of the general public.

Bridges and Culverts.—The cost of bridges and culverts is continually increasing, due to:

(a) The fact that rolling-stock and equipment

are increasing in weight. During the past twenty-five years the average weight of locomotives and loaded cars has doubled, requiring bridges and culverts of proportionately stronger construction.

(b) The fact that the ideas of engineers and railroad managers are tending towards stronger and safer structures, and that a surplus of material is being used in iron and steel structures, particularly on shorter spans than were formerly considered requisite to safety.

Graduation.—The cost per cubic yard of this item has been gradually decreasing, on account of the improvement in methods and machinery adopted for work of this character. On the other hand, the quantity of material considered necessary for railroad construction has increased. In the past twenty years the standard cross-section for embankments has been enlarged from 14 feet to 18 feet in width at sub-grade; excavations, from 20 feet to 28 feet.

Ballast.—The cost of ballasting, more than any other item, is affected by local conditions, but has not materially changed.

Track.—Under the head of track is considered the cost of ties, which has steadily been advancing year by year. The cost of grade ties has been substantially doubled in the Mississippi valley in the past thirty years. This item has also been affected by an increase in the quantity used, the number of ties to the mile having been increased on first-class roads from an average of 2,640 to about 3,000. As to rails, while it is true that there has been a steady and uniform decrease in the price of steel during the last quarter of a century, the average standard weight

of a rail for main lines has at the same time increased from 60 pounds to 90 pounds per yard, and the quality has materially depreciated. As an example of the deterioration that has taken place in quality, the writer may state that during the past year he has moved from a main track on tangents rails that weighed 75 pounds to the yard, which had been in the track only five years; whereas, in the same district and under the same traffic conditions, there still remain in the track 60 pound rails that have been in service for over fifteen years, which it was not considered necessary to renew this season. While this may be an exceptional case, the writer considers the steel rail which was furnished by the manufacturers, fifteen to twenty years ago about 50 per cent better than the rail now manufactured. This is not intended to apply to special high-class rails, which may be furnished by a few rolling mills under superior specifications, but to the ordinary rail, supplied to and purchased by the majority of the railroads in the United States to-day. The reason of this inferiority hardly comes within the scope of this article.

Fencing and Telegraph.—These items have remained practically unchanged during the last few years.

Water Supply.—As business has developed on the railroads, a larger and more constant supply of water has become necessary, and tanks, wells, and reservoirs are now being constructed of much larger capacity than ever before. The capacity of tanks and pumping machinery has been practically doubled.

Station Buildings.—The increase in the cost of

station buildings is not due to an increase in the price of material, but a growing necessity for better accommodations for the travelling public arising out of a natural increase in business.

Round-houses and Other Structures.—The cost of round-houses is substantially the same, except an increase due to a demand for additional facilities, improved smoke-stacks, more expensive engine-pits, turn-tables, etc.

General and Legal Expenses.—These have greatly increased in late years, due to the many new complications that are constantly developing in railroad construction, as population and railroads increase.

Terminals.—The expense of railroad terminals is rapidly increasing year by year, because of the growing density of population in cities and the fact that the earlier railroads occupy the most advantageous situations.

Equipment.—The cost of equipment is practically the same as it was a quarter of a century ago. While engines have been increased in size and weight, cars in strength and capacity, and coaches and sleepers in elegance and accomodation, a corresponding decrease has taken place in the price of material and machinery used in their construction. There has also been a fierce competition between large corporations engaged in the manufacture of different articles of railroad equipment, which has had an influence in lowering prices.

"In the foregoing estimates and remarks two items have been mentioned which are of such considerable importance that we may mention them further.

"The cost of railroad construction has been materially increased of late by the necessity of providing crossings for the new lines over the existing roads. In the earlier years of railroad construction, if the junior road would agree to put in the crossing frogs and maintain them, the senior road was satisfied. Now the senior road frequently requires the junior road to construct its lines over or under the existing road. The expense of a crossing of this character varies from $10,000 to $100,000, according to local conditions. Even if an over- or under-crossing is not insisted upon, expensive interlocking plants are required which entail additional burdens on the new road, not only in the first cost of construction, but in operation and maintenance as well.

"The most important item of cost in railroad construction, however, is that of terminal expenses in the larger cities. This expense has become so great in the leading cities that new roads usually prefer to rent their terminal facilities from existing lines. In Chicago to-day there are roads paying a rental for terminal facilities—and restricted terminal facilities at that—equal to the interest on $10,000,000. In order to emphasize the importance of this item, the writer will assert that, if a new line of railroad were built from Kansas City to Chicago by way of St. Louis, with adequate terminal facilities in these three cities, the cost of the terminals would be in excess of the cost of the road, fully equipped.

"The total cost of railroad construction is continually increasing year by year. While some items may have been cheapened on account of the lower price of material or labor, or by competition, other items are increasing in much larger proportion; and the

public requirements of safety, speed, and convenience are steadily adding items of cost which in former years were not considered necessary—among them, superior character of the road-bed, block and interlocking signals, air-brakes, patent couplers, special cars for high-class products, etc.''*

Sec. 67. The Right of Way

Having presented to the reader the main principles of railroad construction and the elements of its cost, it is essential at this point that some reference should be made, and in considerable detail, to what is known as permanent way.

The steel rails and the ties to which the track is held by fish-plate and spike are movable things resting upon a bed of ballast, which in turn has for its basis what is called in railroad terminology the subgrade. The permanent way consists of the track, culverts, trestles, viaducts, bridges, etc., and it is located in the middle of what is termed the right-of-way, a space 50 to 100 feet wide, running through the territory where the railroad is to be built. The subgrade is made by cuts and fills which are supposed to balance each other so far as possible, but in the case of deep fills a rude trestle is used, upon which cars carry out the dirt from some cut in the neighborhood of the fill. This grade when completed is from 26 to 32 feet wide in the case of the double track road, and 14 to 18 feet in the instance of a single track road. The grade is usually rounded to drain the water in either direction. Upon this grade the ties and rails are laid, to be held in place later on by ballast.

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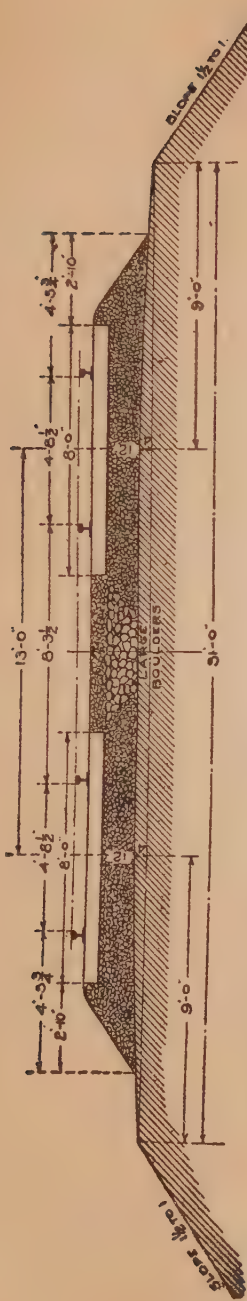
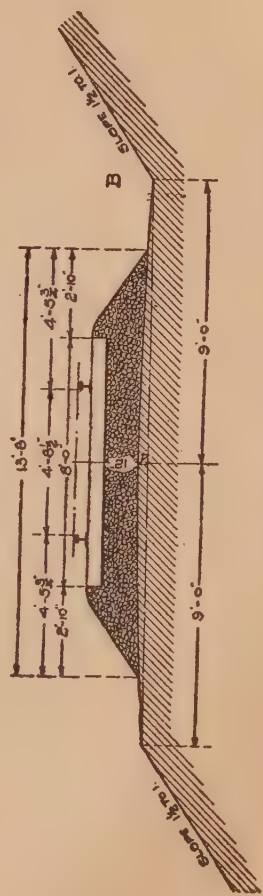
*End of Article by J. F. Wallace.



Double Main Track, Broken Stone, Furnace Slag and Crushed Boulders. Chicago & Alton R. R.



Single Main Track, Broken Stone, Furnace Slag and Crushed Boulders. Chicago & Alton R. R.

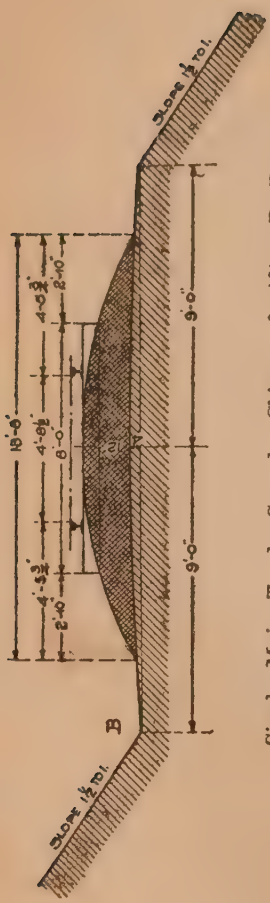
Sec. 68. Ballast, Ties and Rails

Ballast.—The ballast is used for four reasons. First, in order to distribute the load upon the track over the entire roadbed; second, to form a support for the ties; third, to provide drainage; and, fourth, to allow surfacing and arranging the track without disturbance to the roadbed. Ballast is defined as selected material placed on the roadbed to hold the track in line and to permit surfacing of material between the cross-ties. The question of what ballast shall be used is a very important one, as it practically determines the efficiency of the road as a carrier of traffic. A perfect ballast consists of material that is hard and durable, which at the same time will stand tamping and the atmosphere, is easily handled and readily adjusted, and allows water to pass off readily, and which has no chemical properties likely to affect the cross-ties. It must be securable at a reasonable cost and near at hand, so as not to necessitate long and expensive carriage. The best ballast is broken stone, which is followed in order by gravel, furnace slag, cinders, burnt clay, sand, chert, and chats. The best stone is granite, gneiss and trap rock, and when broken should pass through a 2½-inch ring. It is generally understood that stone should not be used on a new roadbed, but that free gravel, sand or cinders should be placed upon the sub-grade before the stone is used as ballast. Loose gravel, while making it easier to renew ties, promotes vegetation. Cinders are excellent, but often cause decay of the cross-ties and sometimes corrode the rails. The experienced railroad man knows that a roadbed is a thing

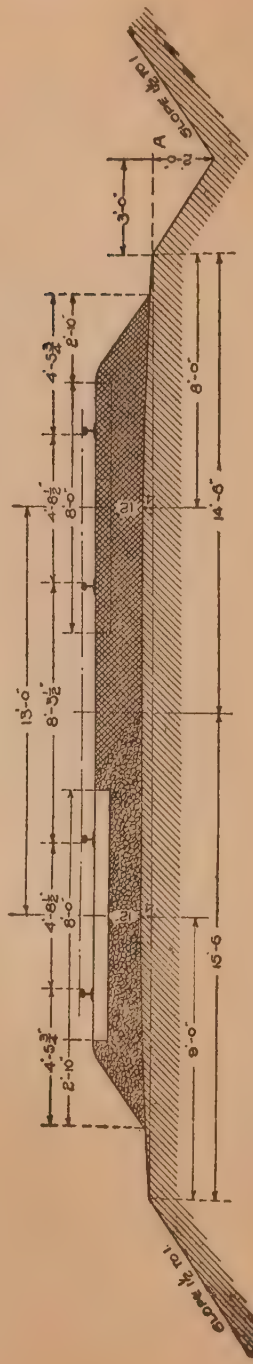
of growth. The older it is, the firmer and more resistent its qualities and the more it is able to react against the eroding forces of nature.

A few figures regarding the cost and quantity of material necessary for ballast may well be given here. Stone ballast costs from 80 cents to $1.20 per cubic yard, the gravel ballast 26 to 65 cents per cubic yard. These figures are based upon the supposition that there will be twelve inches of ballast under the ties, and that 3,000 cubic yards per mile will be required. On the Illinois Central the rock ballast varies from 2,600 cubic yards to nearly 4,000 cubic yards per mile in different parts of the system.

Ties.—The province of the cross-tie, as it is called in railroad terminology, is to distribute the pressure received from the rail over a greater area and to hold the rails in their relative position. For this important purpose many woods have been used by railway companies, and in the United States, where wood has been available, practically all of the ties in use are wooden, though in Germany, India, Africa, South America, and Mexico, steel ties are now used in large numbers. The woods which are used are oak, pine, cypress, cedar, chestnut, and hemlock. More than one-half the ties now found on railroad right-of-ways in this country are oak. The percentage is stated to be oak 55, pine 22, and cypress, cedar, chestnut and hemlock make up the balance. A tie is a piece of wood 7x10 inches wide, 6 inches thick, and 8 to 9 feet long. They are placed under the rails at a distance of 1½ to 2 feet apart. It is customary to count 2,500 ties to the mile. One of the difficulties with which the railroad company is confronted



Single Main Track, Gravel. Chicago & Alton R. R.



Main Track and Side Track. Main Track Broken Stone, Furnace Slag and Crushed Boulders; Side Track Engine Cinders. Chicago & Alton R. R.

is the decay of ties. Their life depends upon the character of the ballast, the weight of the rails, the density of the traffic, the temperature and the atmospheric conditions. The ordinary oak tie is supposed to last from seven to eight years. Various attempts have been made in recent years to legnthen the life of the tie by treating it with some preservative process. This has been done by the use of creosote with satisfactory results, and as long as it is possible for the railways of the United States to secure wooden ties, which make the use of the spike possible, as well as giving a spring to the track which cannot be secured by the steel tie, it may be expected that the railroads will continue to use them instead of manufacturing steel ties. Mr. J. T. Richards, Chief Engineer of Maintenance of Way on the Pennsylvania, has summarized the objections to steel ties as follows:

(1) Increase expansion and contraction in all parts of the track.

(2) Weigh about one-half as much as wooden ties, and do not make heavy enough track.

(3) Connection of metal between rail and tie is derimental.

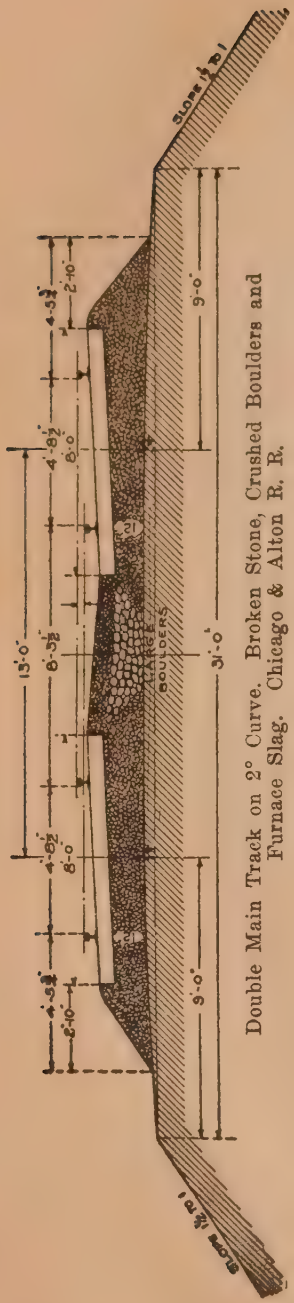
(4) Are noisy.

(5) Have not the elasticity or cushion that a wooden tie has.

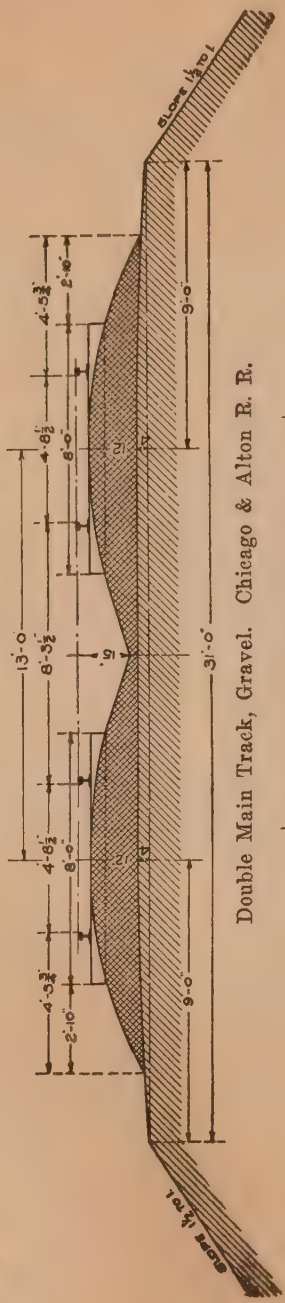
(6) Are more expensive.

(7) Could not be used with automatic signals, because they would connect current between rails.

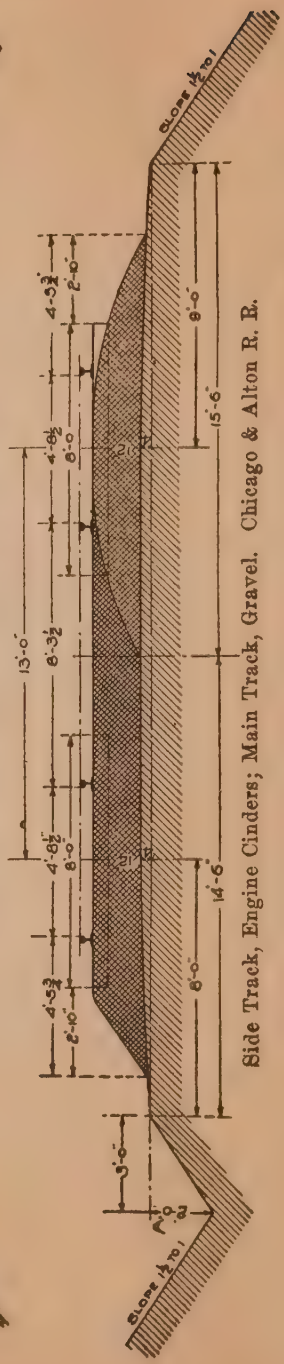
These objections are sufficient to cause the railroads to seek the wooden tie for their purposes, although the outlook for a supply of ties is not very



Double Main Track on 2° Curve. Broken Stone, Crushed Boulders and Furnace Slag. Chicago & Alton R. R.



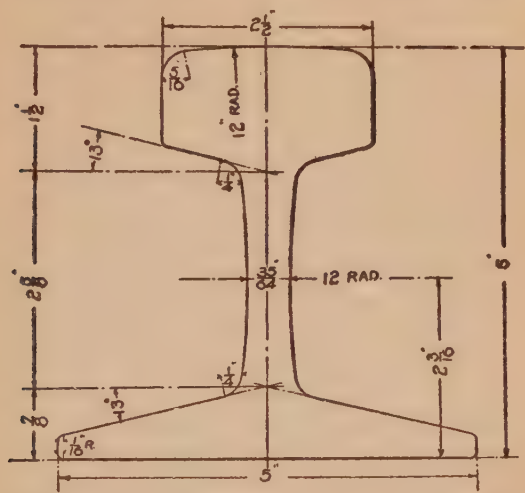
Double Main Track, Gravel. Chicago & Alton R. R.



Side Track, Engine Cinders; Main Track, Gravel. Chicago & Alton R. R.

encouraging, and cannot be until roads develop a systematic scheme of forestry whereby material can be grown for railroad use. The study thus far made shows no obstacles in the way, but the adoption of a plan requires foresight and patience.

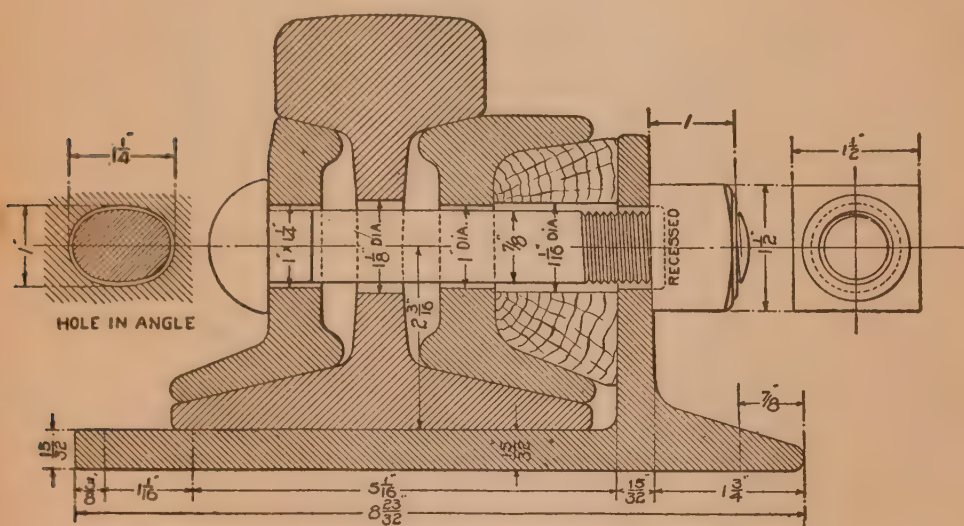
Rails.—Of the various accessories to the construction of a railroad it is more than likely that most au-



Section of American Society of Civil Engineers' Rail, 80 lbs. per Yard.

thorities would place the largest stress upon the rail. Much could be said regarding its history and its manufacture. The expenditure for rail renewal, due to the use of heavy rolling stock and somewhat inferior rails, is next to tie renewal the largest item of maintenance of way expense. The decreased wearing power of the larger rail has brought into experimental use the nickel steel rail, which has 2-3 times the life of the Bessemer rail, and saves, as a consequence, at least half the cost of labor, as well as reducing the wear and tear of the tie. A rail now in

general use in the United States is what is called the T-rail, weighing from 60 to 90 pounds per yard. A considerable difference in practice is found among the railways of the United States in laying of rails. Some roads lay the rails so as to alternate the joints; others lay the joints even; while on some roads, the joints are laid even on the ordinary line and alternate on curves. The usual practice is to suspend the rail



Cross Section 29-Inch Weber Joint for 80-lb. Rail.

joints between the ties. Economies in the use of rails can be worked out by employing worn rails in side tracks or cutting off the battered ends to relay them in unimportant parts of the main track. Such work costs about $180 a mile for 70 pound rails and $220 for 85 pound rails, while the 135 tons of new rail would cost $1,400 to $1,500 a mile, depending upon the market. Sometimes the re-rolling of rails is re-

sorted to, though this reduces the weight, but the cost is low and the rail a better rail after the process.

Sec. 69. Railroad Signals

Railroad signals may be divided into two general groups,—interlocking signals and block signals. The first are used for the purpose of switching trains and guarding junctions. The second has for its purpose the spacing of trains and movement of traffic on main lines. The interlocking system of signals consists of semaphores and tower houses in which are levers controlling various combinations of tracks. The lock was first invented by Saxby in 1856 and materially improved three years later. The difficulties in the moving of switches by the use of a lever necessitated the introduction of power systems of interlocking, and these belong to one of three types. First, what is called the low pressure pneumatic; second, the electro-pneumatic; and third, the all-electric system. These differ in the method of applying the power to the levers and the movement of the tracks; but under present conditions it is possible by the use of the power system of interlocking signals for one man to operate the switches in a large yard. The guards which are provided prevent the movement of trains except in accordance with the signals and setting of switches from the tower.

The block signal system is a method in use on railways to insure greater safety while holding trains a certain distance apart through the division of the line into blocks or sections, entrances to which are guarded by appropriate signals for the movement of the train. These blocks may be any reasonable

length determined by the physical characteristics of the line and the density of the traffic. They often vary from a block of 200 yards in length to one which may be several miles.

There are four types of such systems, known as (1) the manual block system, (2) the controlled manual block system, (3) the staff block system, and (4) the automatic block system. In the first system the entrance to the block is controlled by the operator at the station. The entrance of a train into the block is heralded to the operator at the next block by electric signals. This system is much in use in England. In the United States a cruder device is used by most of the railroads, in that the entrance of the train into a block is permitted by the operator through the turning of a signal and then by the announcement by telephone or telgraph to the next station agent that the train has passed his station. In the controlled manual block the signals at the entrance to the block are controlled electrically by the signal man at the block station in advance. When this system is operated automatically there is at each block station a track circuit by which a signal indicates that the train has entered upon the block. This system prevents the entrance of the train into the block ahead until certain requirements in the operation of the system are met.

The staff system of block signals is so termed because the engine man is required to have in his possession a staff, which can be used to open the block next ahead and permit his train to enter it. A train staff machine consists of an iron pillar with a vertical slot through nearly its entire length, in which is a

supply of staffs. The head of the machine contains the electrical apparatus for manipulating it. Only one staff can be withdrawn at a time from the two machines governing a block, and this only with the consent of the signal man at the receiving station, who alone controls the staffs at the sending station. Moreover, a second staff cannot be removed from either machine until the one already out is restored at one or the other end of the block. This system has a great many advantages, due largely to its great safety and the fact that it permits the operation of a single track road with practically no accidents. However, it has the disadvantage of requiring considerable time to work it.

The automatic block signals are operated by gas, compressed air or electric cells. This system is operated on two plans,—the normal safety plan, in which the signals always show safety unless the block is obstructed, and the normal danger plan, in which the signals always show danger except when cleared by an approaching train, and this can be accomplished only when the block is clear of trains. When an engine enters an automatic electric block a current short circuits, and the break in the local circuit causes the signal to operate. Under the first plan, when a train passes out of the further end of the block the signal returns to safety. Under the second plan, the signal is set at danger until it is cleared by an approaching train.

It has been found that block systems, especially the automatic block systems, work with almost no failures. A series of experiments has shown that one failure in about 22,000 operations has resulted. On

the ordinary road there are not more than 15,000 signals in a year. This system costs about $800 per mile for installment, and can be kept up at an annual cost of about $160 for each signal. The electric cells last from fifteen to eighteen months. The tendency in the United States at the present time appears to be to adopt this type of signal for the operation of trains.

Sec. 70. The Train Dispatcher

The movement of trains is so closely associated with the signal system that something should be said of the dispatching of trains. Through the use of the telegraph, and of late the telephone, and the signal system, trains are guided over railroad lines in great number without accident. The problem is increased when the road is a single track line, although the use of the telegraph grows simpler with experience and makes it possible to operate the road with great efficiency. The dispatcher knows the road thoroughly, the rating of all locomotives, and what may be expected of every train. By the use of a sheet on which the movement of trains may be noted, the dispatcher has before him a picture of the road at any given moment. The three methods of telegraphic dispatching generally used are known as the single order, duplicate and triplicate order. Under the duplicate order each of the opposing trains receives a copy of the order, the triplicate system calls for an order to trains at the stations on either side of the meeting point and a third order to the trains at the station where they pass. Many devices are used to check mistakes. Before the order leaves the dispatcher's

office its history is noted on the original, and the operator receiving it repeats it back to the dispatcher's office. As these records come to his office the dispatcher enters them upon the sheet before him, where is set forth a record of every train in fullest detail. It is only within limits that the dispatcher can protect the train, and under the old system the engineer was often compelled to feel his way; but with automatic signals he is warned of the presence of a train in advance of him. In addition, the railroads have developed an elaborate code of audible and visible signals to give warning of danger. The torpedo and whistle furnish the means of the audible signals, and the fixed flags and lanterns give notice of switches and other possible impediments to traffic.

Sec 71. The Importance of Maintenance of Way

The importance of maintenance of way in the operation of railroads in the United States is well brought out by the statement that twenty per cent of the operating charges can be laid to the expense of maintenance of way. This item distributed over the various expenses as enumerated by the Interstate Commerce Commission amounts to nearly $350,000,000 annually. The table given below shows both the amounts and the percentages in detail.

Source of expenditure—	Amount. *1907.	Prop. to total Oper. expenses. Per cent.	Prop. to total Expenditures. Per cent.
Maintenance of way and structures	$ 343,544,907	19.65	14.59
Maintenance of equipment..	368,061,728	21.05	15.63
Conducting transportation..	970,952,924	55.53	41.22
General expenses	65,404,655	3.74	2.78
Unclassified	551,600	.03	.02
Total operating expenses.	$1,748,515,814	100.00	74.24

Fixed charges, operating roads	606,731,454	.....	25.76
Total expenditures, operating roads	$2,355,247,268	.....	100.00
Fixed charges, subsidiary roads	70,981,064	.....	.....
Total expenditures, all roads	$2,426,228,332	.....	.....

* 227,454.83 miles of line represented.

A committee of the American Railway Engineering and Maintenance of Way Association, at the annual convention in 1900, recommended that the organization of maintenace of way departments should be made more uniform, with the titles and rules arranged and adopted by the railroads of the country. The suggestions made were somewhat as follows:

1. A Chief Engineer,, who was to be the active head of the department, with sufficient assistance to give him an opportunity to investigate important subjects pertaining to his department, visit other railroads and seek for improved methods.

2. A Principal Assistant Engineer, who was to represent his chief and to carry out such duties as were assigned to him.

3. A Signal Engineer, having in charge the designing and installation of all interlocking plants, block signals, bells and other devices for approaching trains.

4. A Bridge Engineer, who shall have in charge the designing of bridges, trestles, and culverts, frequently inspect the same, and report to the Chief Engineer.

5. An Architect, who should have in charge the designing and erection of all important buildings.

6. A Real Estate and Tax Agent, in whose hands rests the care of the real estate and right-of-way,

and the protection of the company in the various tax returns and assessments made against it.

7. A Superintendent of Telegraph. This officer reports to the Chief Engineer on all matters of structure and maintenance, and has charge of the construction and operation of telegraph and telephone lines.

8. Engineer of Maintenance of Way, who is the working head of the department, and has charge of all classes of work, reporting to the Chief Engineer.

These seven officers form a staff for the Chief Engineer, and may be called upon for consultation and suggestion, as a sort of advisory body.

The great question disturbing the minds of boards of directors, managers and engineers is how to secure sufficient money to carry on the construction work they have in mind. The object in the larger equipment and better roadbed is to increase the number of tons hauled per train mile, since the amount of freight carried per train is the greatest factor in determining the ton mile cost. The reduction in train miles, as shown at the opening of the chapter, means a positive saving in money. How to reduce grades over long sections of a trans-continental line is a difficult problem; to break up trains at the end of a division, where a change in the rating of locomotives is necessary because of heavier grades, means more expense to move the traffic, but when accomplished, even over several divisions, time and money are saved. When the gradients are thoroughly known, not only by the engineer's office, but also by the managers, reassignments of motive power can be made to great advantage. Ideally the aim is to make

train tonnage as nearly uniform as possible in adjacent divisions; but this requires new locomotive ratings with each change in grade. On one system, by the equalization of power and grades, adjacent districts which originally rated 840 and 425 tons were brought to a uniform rating of 1,350 tons for both directions, and the saving in traffic movement was very marked. No less than 4,568,454 train miles were saved by this road, or a cash saving of $16,000,000, equal to a dividend upon the common stock. It is well said that maintenance of way is the real foundation for successful railroad management.

The figures of cost, etc., given in this chapter are based upon the normal conditions existing prior to the World War, when material and construction costs of all kinds were greatly increased.

CHAPTER III

MOTIVE POWER AND ROLLING STOCK

Sec. 72. Description of the Locomotive

The locomotive has been defined as a steam engine and boiler mounted on wheels, and so connected with them as to be capable of self-propulsion along the railway track. This mechanism has passed through a long history and much evolution. It is today a delicately balanced machine holding three forces in equilibrium for the service which it attempts to render. These three forces are the steam-producing power found in the boiler fire-box and the necessary parts thereto, the mechanical power developed through the cylinder or attached machinery and transmitted to the driving-wheel, and the traction power developed through the frictional resistance to the sliding of the drivers on wheels. The force available through these three factors is limited by the quantity of steam that can be produced in the boiler of a given weight and size and by the total weight of the machine in proportion to the driving wheels. The cylinder, a necessary part of the locomotive, may be indefinitely great, and in no way limits the construction of the locomotive or the application of the power.

The boilers used in the building of locomotives

are of an approximately cylindrical type, filled with longitudinal tubes, and having an internal furnace at one end and an attached smoke box and stack at the other. The fire-box is surrounded on all sides except held in its place by stay bolts. These are of very great the bottom by the boiling water, and is supported and importance in the construction of the locomotive and their holding power forms one of the difficult problems of the railway engineer. The fire-box is rectangular in plan and has a sort of balloon shape in a vertical traverse section. Formerly it was the practice to make the fire-box narrow, so that it would be possible to set the engine between the frames, but the practice today is to place it on top the frames and thus obtain as great width as the engine itself. The bottom of the box is formed by a grate. This is of various forms, depending on the character of the fuel and the kind of service demanded of the engine. The smoke box is the chamber in front of the boiler, into which the gases of combustion flow from the tubes. In most locomotives the gases issuing from the tubes strike a diaphragm plate and are deflected downward or pass through a netting and out of the stack. The exhaust nozzle, as it is called, is in the middle of the smoke box, and the steam issues from it after it has been used in the cylinders of the engine. The mechanism used to apply the steam pressure to the rotation of the driving wheels consists of the cylinders, pistons and piston rods, together with such connecting and parallel rods as are necessary to attach the driving wheels to the working mechanism. The cylinders are placed on each side of the locomotive, in the simple type, and consist of three parts,

—the cylinder, the steam chest and the saddle,—the saddles of the two cylinders being bolted together, and in this way providing a support for the boiler. The steam-chest of the cylinders receives the steam from the boiler and admits it to the cylinder.

Many improvements have been made upon the simple type of steam cylinder used in the earlier days of the locomotive. Practically all locomotives now have some combination of what is called the compound cylinder. A locomotive of this type uses high and low pressure steam, the steam passing from the boiler into the high pressure cylinder first, and then from that cylinder into a second one much larger, where it is used again before passing into the exhaust. Through this means the power of the locomotive is materially increased, and the principle has been extended so as to include locomotives of three and four cylinders. The type just described is referred to as the cross compound. In addition to this, there is the Vauclain compound, which consists of four cylinders, two on each side, one above the other, and one of which is a high pressure and the other a low pressure cylinder. Each cylinder is governed by a piston valve, which effects the distribution of the steam from the time it enters the high pressure cylinder until it leaves the low pressure cylinder and is exhausted into the atmosphere.

Another type is the tandem compound, which finds much favor in heavy freight service. It is so called because the cylinders are placed one ahead of the other on the same axis, the high pressure cylinder being placed ahead of the low pressure one.

Under this system the steam exhausts from the front end of the high pressure cylinder to the back end of the low pressure, and vice versa.

There are many other kinds of compounds, such as the Webb, used in England, the DeGlahn and Mallet in France, and the Walschaert in Germany. Through the use of the compound cylinder a high economy of steam and saving of coal, with a material increase in the power of the locomotive, are secured. The locomotive of compound type develops its maximum efficiency and fuel economy when working under its greatest load, whereas the old single expansion engine developed its minimum economy when working under the maximum load, and, what perhaps is just as important, this type of engine develops its minimum economy with a minimum load. The result is that the task of the fireman and of the engineer is made a great deal easier than it was with the old type of locomotive, even though there is a marked increase in the size of engines and of trains.

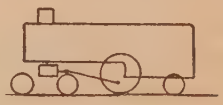
The compound locomotive costs more at first and is more difficult to repair, but according to the report made by the American Railway Master Mechanics' Association, it has these advantages: first, it reduces internal waste; second, it can be adapted to the load; third, it reduces leakage of the engine to a minimum; fourth, it reduces depreciation in boiler; fifth, has a greater boiler efficiency; sixth, has a lighter blast, smoother draught, less waste and annoyance and danger from sparks; seventh, has higher limit of speed and power; eighth, reduces the loss by tender and fuel haulage; ninth, has a better

motion when travelling; tenth, has a greater efficiency.

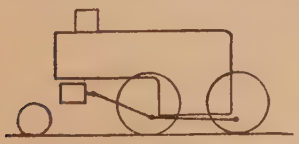
Sec. 73. Classification of Locomotives

Speaking in the large, locomotives can be classified on the basis of the service which they render, as passenger, freight or switching engines. The usual method, however, since any locomotive can be used for any service, is to designate them by the number of wheels which support the boiler and determine the adhesion of the locomotive to the rails. Following this suggestion for classification, since it is the one most generally used by motive power experts, we find the following types:

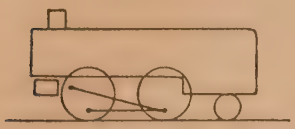
(1) Single type locomotive. Much used in Great Britain and somewhat in France and Germany. It consists of a single pair of driving wheels, with three pairs of truck wheels, two of them being forward of the drivers. It is adapted for light, high-speed service, and is noted for low cost of maintenance and high mechanical efficiency, but being limited in adhesive weight, it is difficult for the engine to start heavy trains.



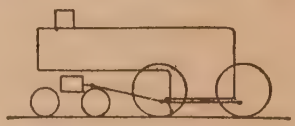
(2) The four-couple, three-axle type, consisting of two pair of drivers with a forward truck, used in France, Germany and England for moderate passenger traffic. The famous engine "Charles Dickens" belonged to this type and it won an unusually favorable reputation for service by pulling a train one million miles in nine years, two hundred and nineteen days.



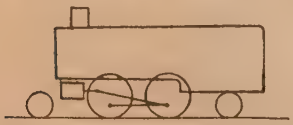
(3) The leading drivers type, so called because of the fact that the drivers precede the truck wheels, is used in England for fast passenger traffic, and has the advantage of great power for its weight. It is said, however, to lack stability, and that the placing of the drivers forward produces rigidity, tending to strain the machinery.



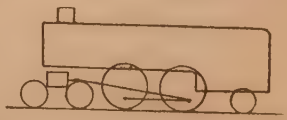
(4) The American type, so called because first used in this country. It consists of two pair of drivers, with a forward four-wheel truck. It is a safe, steady running and trustworthy engine, with unusually even distribution of weight, and can be utilized for many purposes. It is regarded still as an all-around locomotive.



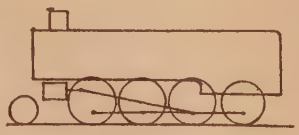
(5) The four-couple type. A locomotive with a leading and trailing axle, with two pair of drivers between, which is now being used experimentally in the United States. It has the advantage of concentrating weight and increasing the adhesion of the locomotive by the centering of the drivers.



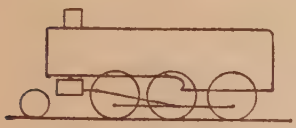
(6) The Atlantic type. This locomotive consists of two pair of drivers, with a four-wheel leading truck and a pair of trailing wheels. It is employed in high-speed passenger service, and is the type of locomotive used by the New York Central and the Pennsylvania for much of their passenger traffic.



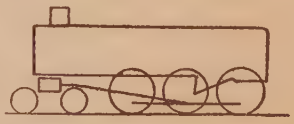
(7) The Switching Engine. This is called in England and on the continent the six-couple double adhesion type, where it is the standard goods engine. In the United States it is used almost exclusively for switching purposes.



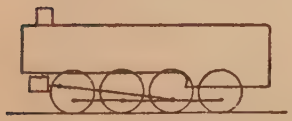
(8) The Mogul. This type of locomotive has three pair of drivers and a pair of leading wheels, and is used for heavy freight service, although on some roads it has been developed into a passenger locomotive for heavy trains.



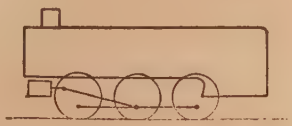
(9) The ten-wheeled compound. This is a powerful engine used for freight purposes. The design permits ample boiler capacity, with great adhesive weight and moderate axle loads. It is of special value for heavy trains and mountain work.



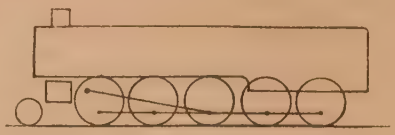
(10) The eight-couple type. This locomotive is comparatively unknown in America, but it is used in England and on the continent for heavy freight trains.



(11) Consolidation type. A type of locomotive used exclusively for freight service. In the United States it has been built of great size, and is sometimes extended until it becomes a twelve-wheeler or mastodon type.



(12) The Decapod. So-called because it has five pair of drivers and no truck wheels, and is used as a pushing engine on grades and in heavy freight service.



The construction of great terminals in the large cities, like those especially in New York, Boston, Baltimore and Philadelphia, where long tunnels are required to get into the cities, have brought into use the electric locomotive, and in some instances their use has been extended to the movement of passenger traffic, as on the New York, New Haven and Hartford Railway, where they operate between New York and New Haven. The Pennsylvania Railway has constructed recently the largest type of electric locomotive ever built, and the Scientific American reporting it recently says that "this giant machine is a curious instance of what might be called the vagaries of mechanical evolution, in that it is furnished with those side-rods and connecting rods, the abolition of which from the electric locomotive was considered to be one of its principal points of improvement.

"Theoretically, to get rid of the reciprocating movements and unbalanced rotating weights of the steam-locomotive was eminently desirable, for these unbalanced weights were the cause of much destructive wear upon the track and roadbed. Furthermore, the substitution of the compact electric motor, encircling the driving axle, was considered to be an ideal arrangement of compactness and efficiency.

"When the electric drive came to be applied to steam-railroads, as in the case of the electrification of the New York Central and New Haven roads, it was found that the above-mentioned advantages were obtained at the expense of collateral disadvantages of a very serious character, for the low center of gravity, the rigid wheel base and the large amount of non-spring-supported weight combined to make the locomotives very destructive of the track.

"The most original feature of this engine, at least in American practice, is the removal of the motors from the wheel axles and the substitution of a single motor which is placed above the frames and within the cab. This motor weighs, without gear, 45,000 pounds, and in weight and power it is the largest railway motor ever constructed. At each end of the motor-shaft is a crank, the two being set, as in steam-locomotive practice, at 90 degrees. From these cranks a pair of coupling rods lead down to a crank-shaft (known as the jack-shaft) which is carried in the frame in a horizontal line with the axles of the driving wheels. The jack-shaft cranks are coupled to the drivers.

"Now it will readily be seen that this arrangement avoids all the difficulties of counterbalancing which have been such a nightmare to the steam locomotive designer and to the track superintendent, for since the motor crank revolves uniformly and at constant effort, differing therein from steam practice, the turning effort of the drive-wheels is the same as for the motor, and is constant throughout each revolution. Moreover, it will be seen that since the move-

ments of all rods and moving parts are those of pure rotation only, it is possible to secure a perfect coun- the track and roadbed than a passenger car of equal weight. * * *

"The controller on the 'Pennsylvania' type is scarcely as large as that on a Hoe printing-press. None of the main power passes through it, as it is really a switch corresponding to a telegrapher's key, operated by electro-pneumatic means. With a lever which can be moved with one finger, the engineer can admit to the locomotive a current equal to that available in a hundred trolley-cars.

"The electric supply will be secured from an electric conductor, or third rail, by four contact shoes on each locomotive. At some points where the great number of track switches will not permit this, the power will be secured from an overhead conductor through an air-operated overhead contact-shoe, of which there are two on each locomiteve. The first locomotive, which is now being tested both as to speed and hauling power on the Long Island Railroad, is giving satisfactory results."

Drawing showing special driving gearing of new electric locomotives in use on the Pennsylvania.

In addition to the types of locomotives referred to above are a number of others in more or less use at the present time. Among these is what is called the Forney type, invented by N. N. Forney, some twenty-five years ago. In this locomotive the tender and engine are combined on one frame, the tender being placed in front, so that the weight of the engine can be placed upon the drivers. The point in the development of this type is to give a greater tractive power for the size of the engine. It, however, has not proven a satisfactory locomotive for general service, as many stops have to be made in order to terbalance, and the engine delivers no more shock to give the engine an opportunity to keep up the steam needed in so large a boiler area.

The Great Northern Railway recently built one of the largest locomotives that has ever been made. The engine is of a type known as the Mallet Articulated Compound. The total weight of the engine and tender is 468,000 pounds. The idea of its construction is that of a tandem bicycle with an additional unit added. This gives the engine an unusual length of 92 feet from pilot to the rear end of the tender. There are two sets of cylinders; the back or high-pressure cylinders receive the direct steam, and the front or low-pressure cylinders use it a second time. It is expected that this engine will prove capable of moving from 100 to 120 fifty-ton cars on a level track. It will be placed in service on the mountain division of the Great Northern, where it will be given a thorough try-out of its pulling powers.

Sec. 74. The Weight and Resistance of Trains

The tonnage which a locomotive is able to move depends upon the degree of the maximum grade and curvature, the character of stations, the density of traffic, the weight of cars, time, temperature, winds, and condition of equipment. The attempt in present-day railroading is to reduce grades, and, when they are necessary, to balance them so far as possible, so that in the movement of trains speed going down hill will materially assist in going up the next grade. A grade of two per cent increases the burden on the locomotive by forty pounds to the ton of equipment and load, while a one degree curve is equal in its resistance power to a one-tenth per cent grade. The movement of the train is necessarily affected by the passenger traffic, especially on a single track road, and the facilities which exist in the way of side switches and the like; but aside from this, the speed of the train, the wind and the atmospheric pressure materially affect its movement. According to the tables, a train at a speed of forty miles an hour encounters an atmospheric resistance of 6.2 pounds to the ton. When the atmosphere is below 40° Fahr. the resistance is increased, and a change of 10° adds .3 of a pound resistance to the ton, where the cars are heavily loaded. The effect of winds, especially side winds, on a train is to produce a great deal of friction by forcing the wheel flanges against the "leeward" rail. When the wind is twenty miles per hour, the resistance of a 50-ton car for each ton of the car is 1.6 pounds, and the atmospheric pressure at the same rate is one-tenth of a pound per ton. When all

these elements are taken together it will be found that the pull upon a locomotive is greatly affected by the conditions under which the traffic is moved, so that every yard-master has before him in the making up of a train the conditions which the equipment is likely to meet in covering its mileage. The various statisticians have estimated the draw-bar pull of a large 113,000 pound locomotive at fifteen miles per hour as 100 per cent. The train resistance under the same conditions is regarded as 100 per cent. As the speed of the train increases the traction power of the locomotive declines, and the resistance of the train increases, while the allowable weight of the train declines. Consequently, the character of the service determines the type of locomotive, and the weight of train, and the character of the load.

Sec. 75. The Rating of Locomotives

Every locomotive on a railway system has what is called a rating, which is an estimate of the tonnage a locomotive can drag under certain normal conditions. There are three different views regarding the basis on which the rating of a locomotive should be determined. These are (1) to give the locomotive that rating in the amount of maximum tonnage that can be moved between terminals in a given time; (2) to give the locomotive the largest load that it can haul on an average during the life of the engine; (3) to base the rating of the locomotive upon the largest amount of tonnage that can be moved at a minimum cost; under this view the speed of the locomotive and of the train is a minor matter,—

the question is the dragging of the largest tonnage. Under any circumstances, however, weather, grades, curves, siding facilities, the number of empty cars in the train, materially affect the amount of tonnage that can be drawn by a locomotive. More than any other one thing affecting the tonnage of the locomotive is the profile of the road. Referring to this matter, a writer in the report of the American Association of Master Mechanics says: "A grade will generally have some curves on it, and if sharp these may constitute a critical or stalling point for heavy trains. The allowance for curvature will, of course, give the power necessary to pass such points, but generally in calculating the load for a locomotive the curvature function may be omitted or reduced to a general average, as in passing through a curve a small loss of velocity will afford sufficient force to take the train around it. So, also, the average grade should generally be taken instead of the maximum, if the latter occurs in short stretches, where the same loss in velocity would help the trains over. If there is to be much variation in speed, the coefficient for this feature should be modified accordingly.

"While in mountainous regions, with long, heavy grades, there is little opportunity to take advantage of the force due to momentum, in undulating portions it may be utilized with the greatest advantage. A velocity of approach to a grade, when it can be reduced in ascending the grade, enables the engine to haul greater loads than it could without such assistance. This is well illustrated on the Norfolk division of the Norfolk & Western. The grade out of

Petersburg, going east, is thirty-seven feet, and is about four miles long. As all trains stop at Petersburg, they are not able to get the benefit of momentum, and a helper is necessary to get over the hill; the summit being passed, the helper returns. A few miles farther the same grade exists, 8,000 feet long, but at this point a preceding down grade enables them to obtain sufficient velocity to pull the train up with one engine, while that at Petersburg required two. This illustrates how stops, crossings, curves, water tanks, etc., will interfere with the make-up of a train, if so located as to prevent the use of momentum, and it is necessary to bear all these points in mind when figuring the rating for an undulating division. Many railway officials contend that the gain from momentum cannot be figured, and while it is difficult to arrive at very accurate figures, yet we think that a fair degree of success can be obtained by carefully considering the various factors in the case. Suppose, for example, that 5,000 feet of one per cent grade were so situated that trains could approach it at speed. The total rise of the grade would be fifty feet, but of that, fifteen feet could be overcome by the energy of the train, leaving thirty-five feet that the train must be raised by the engine. A grade in which the rise was 35 feet in 5,000 would be a .7 per cent grade, so that if the engine could exert sufficient force to overcome the train resistance and that due to a .7 per cent grade, the train could be lifted the remainder of the height by its kinetic energy. In this case the 5,000 feet of 1 per cent grade could be replaced by 5,000 feet of .7 per cent grade, and the effect on the load hauled

by the engine would be the same, if in the latter case the energy of the train were not taken into account. Since the height to which the kinetic energy raises the train is independent of the length of the grade, its effect becomes far less when the grades are long than when short. Thus, for 1 per cent grade, 1,000 feet long, since the total rise is only 10 feet, the kinetic energy would be more than sufficient to raise the weight of the train up the entire grade, leaving only the frictional resistance to be overcome by the engine; whereas, if the grade were 50,000 feet in length, or a total rise of 500 feet, the energy of the train would only reduce this by 15 feet, leaving 485 feet, or the equivalent of a .99 per cent grade to be overcome by the engine, a reduction not worth considering."

Reference was made in a previous paragraph to the effect of empty cars upon the rating of locomotives. "The tests which have been carried on show that on grades at comparatively slow speeds a ton of empty cars requires about 7 per cent more power than the same tonnage in a loaded car. It has always been demonstrated very clearly that the greater the capacity of the car, assuming that it is fully loaded, the less draft per ton to haul it. For instance, a 100,000-pound capacity car will require less draw-bar pull per ton than a 40,000-pound capacity car. The greater the difference between capacity and load of a given car, the greater the difference in the draw-bar pull necessary. We can very well afford along this line to emphasize especially the difference between the power required to haul a ton of empty

cars and a ton of loaded cars at the same speed. At a speed of 25 miles an hour on comparatively level track it requires 50 per cent more power to haul a ton of empty cars than it does a ton of loaded cars."

The heavier cars that are now being used move with a smaller proportion of power than is true of the lighter ones. Nevertheless, it is a mistake to increase the tonnage rating of a locomotive on account of the number of 100,000-pounds capacity cars in the train. While there is an easier draw-bar pull when the train is in motion, there is nevertheless a greater inertia in starting it, and this stress of resistance is much more than when the speed of eight miles per hour is attained. The danger to draft gear is in consequence very great unless this stress has been offset by heavier construction. Where this has been done the tonnage rating of locomotives can be increased as much as 25 per cent. The tendency now seems to be in the direction of determining the rating by weight instead of by the number of cars. The results of tests made on the Columbus, Hocking Valley & Toledo Railway, where 90 per cent of the business is the movement of bituminous coal, show that trains having the same number of cars, and drawn by the same capacity engines, vary as much as 50 per cent. In the case of large class engines, rated at five cars more, it was found that they often had as little tonnage as the maximum of smaller engines. The test of the tonnage system was made by rating each engine at the maximum tonnage shown on the car basis and filling the cars with the amount of tonnage actually called for. Under this system of

rating locomotives about 87 tons more per train were gained than under the old car system. The fact remains, however, that engines are often too heavily loaded, and in consequence burn up too much coal and lose time on the run, many times stalling and breaking down. Better judgment has shown that slightly lighter loading has resulted in an increased gross engine ton mileage, which has proven more satisfactory in time record, in the delivery of freight, in greater contentment of enginemen and trainmen, and in a smaller expense for maintenance of engines and repair of cars. The use of the ton-mile as a means of determining the motive power performance made it possible to compare engine records not only in the same division, but with other divisions, and to ascertain where the difficulties arise in connection with the movement of traffic.

In the proceedings of the American Railway Master Mechanics' Association in 1903 the rating question is set forth in vigorous language. The writer says: "The superiority of the ton to the car as a unit of train rating is due not so much to the fact that it has a constant value as a unit of weight, as that it is a much more accurate measure of train resistance. Soon after its adoption the discovery was made that the ratio between train weight and train resistance was constant, which led to a scientific investigation of the facts by means of dynamometer car tests. These showed that the greater the gross weight per car, the less the resistance per ton; that the heavier the adverse grade, and the slower the speed, the less this difference is. For example: It

requires considerably less power per ton to haul a loaded 50-ton car than a loaded 25-ton car; at a speed of 20 miles an hour, on level track, a ton of empty car has a resistance of 50 per cent greater than a ton of loaded car, while on a 1 per cent grade, at a speed of ten miles per hour, the ton of empty car develops only about 7 per cent more resistance than a ton of loaded car. These discoveries led to the adoption of adjusted tonnage ratings, which increase the nominal weight of empty, partly loaded and low capacity cars in proportion to their resistance per ton, so that the adjusted ratings much more nearly approximate the resistance a train will develop than though the actual weights were used. There is little room for doubt that this refinement of the original plan of tonnage ratings has resulted in still further reducing transportation costs.

"There have been indirect savings in operating expenses, due to the use of tonnage ratings, which are not always considered. I refer to the use of the ton-mile basis for statistics, which naturally followed the introduction of tonnage ratings. Previously the almost universal basis of motive power statistics had been the engine-mile. Because the engines made more miles per ton of coal the lighter the train there was a constant effort on the part of master mechanics and engineers to haul as light trains as possible, in order to improve their records, which no doubt in a measure neutralized the efforts of the transportation department to handle as heavy trains as possible, and undoubtedly increased the cost of transportation somewhat, when compared with the possi-

bilities, and was a source of constant friction between the two departments. The ton-mile basis for motive power statistics changed all this, because it was soon demonstrated that the heavier the train, within reasonable limits, the less the cost of coal, wages, and repairs per ton-mile, and, therefore, it was to the interest of the motive power men to haul as heavy trains as practicable, thus harmonizing the interests and efforts of the employees of both the transportation and motive power departments. It would be impossible to say just what economy was produced by this change in the basis of motive power statistics, but that it was real and considerable in gross amount there can be no doubt. The ton-mile basis also corrected a number of erroneous conclusions, resulting in a clearer understanding of cause and effect, which no doubt led to economies, e. g.:

TABLE I.

	March, 1896.	1897.	Increase %
Average miles per engine.....	2,282	2,289	0.3
Average ton-miles per engine....	782,213	972,486	24

"Had there been no ton-mile statistics, there can be little doubt the conclusion would have been drawn that the average work done per engine in the two years, was practically the same. The ton-mile figures show this conclusion would have been wide of the mark and misleading, and also demonstrate that in this case the use of tonnage ratings increased the work done by the engines 24 per cent, as the class of locomotives was practically the same in the two years.

TABLE II. DIVISION D—JANUARY, 1896

	Miles to ton of coal.		Coal per 100 ton-miles.	
	Lbs.	%	Lbs.	%
Main line, freight	16.6	100	20.79	100
Branch, freight	14.8	112	67.93	327
Main line, freight	16.6	100	20.79	100
Main line, passenger	32.1	193	33.09	159

"Judged by the results on the engine mile basis, the branch freight engines were using only 12 per cent more coal than those on the main line. This record was considered very satisfactory indeed, so far as the branch was concerned, as there were a considerable number of heavy grades and curves on it, while the main line was comparatively level and straight, and the conclusion was naturally drawn that it was not much more expensive, so far as fuel was concerned to operate a mountain district than one on the prairie. But as soon as attention was directed to figures based on the ton-mile it became evident that the heavy grades and curves of the branch required three and a quarter times as much coal as the main line to do the same amount of work. In comparing the relative cost of fuel in freight and passenger service, using the engine mile as a basis, the almost inevitable conclusion was that freight engines used nearly twice as much as passenger engines, but when the basis of comparison was the ton-mile, it became evident that the cost of fuel was practically 60 per cent greater in passenger service.

"It is very generally assumed that the maximum tonnage a locomotive can handle at a speed of about ten miles an hour is the most economical. I venture to differ from this opinion and will first consider the

matter as applying to the conditions which have prevailed throughout the past winter, 1903, during which time there has been practically a freight blockade. Under these conditions the paramount issue, to borrow a political phrase, is to handle the business offered and keep it moving almost regardless of cost, in short, to handle the largest possible number of cars with the power and facilities available. For the sake of argument and illustration, Table III. is presented. It applies to two divisions, the first 100 miles long, and the second 200 miles in length, and is based on the following assumption: First, that it requires four hours to get an engine from its train to the roundhouse, clean its fires, give it necessary repairs, furnish the necessary supplies, and have it on its train again; second, that a train of 40 cars will allow an average speed of 10 miles an hour; third, that a reduction of the train from 40 to 35.2 cars or 12 per cent, will permit an increase in the average speed to 15 miles per hour.

TABLE III.

	100-mile division.		200-mile division.	
Speed, miles per hour..	10	15	10	15
Hours between terminals	10	6.67	20	13.32
Hours at terminals....	4	4	4	4
Hours for one trip....	14	10.67	24	17.32
Trips in 30 days.....	51.4	67.5	30	41.6
Cars hauled per trip..	40	35.2	40	35.2
Cars hauled per month.	2,056	2,376	1,200	1,464
Gain in cars hauled per month	....	320	...	264
Gain in cars handled per month, per cent....	....	16%	....	22%

"These figures show an increase of from 16 to 22 per cent in the number of cars an engine will handle per month, due to a decrease of 12 per cent in the number of cars handled per train, and that the longer the division, the greater the increase. * * * Though there will be a greater number of trains to meet and pass because of the fewer cars per train, the lighter trains will not only make better time between stations, but will also undoubtedly lose very much less time waiting at stations for other trains, because the heavier train will frequently wait rather than take chances of making an advanced meeting point for lack of a few minutes, it seems likely the lighter trains will make even better running time between terminals than shown in the tables. The conclusion was amply confirmed by personal experience during a period covering a couple of months, during a series of locomotive tests in heavy freight service, when the time lost waiting for other trains frequently reached 45 per cent of the time between terminals. This experience was on a road which was single track for three-quarters of the distance over which the tests were made.

"In all cases where a congestion of business has occurred on any division, a reduction in the tonnage of trains has resulted in an increase in the speed of movement of traffic, and has invariably raised the blockade, without assigning any more power to that division. During the time the maximum tonnage was handled we were in daily receipt of engine failures, due principally to engines leaking, not steaming, etc., which the operating officers claimed, as a rule, as the

cause of long hours on the road. The position I have always taken is that these failures were due to the long hours on the road and that the long hours were the cause, not the result of engine failures. The immediate improvement in the reduction of engine failures with the reduction of tonnage, was certainly conclusive evidence of the correctness of this position.

"The following figures give the percentages of overtime paid to engineers and firemen, in relation to their total wages, during June, when there was no special rush of business and the engines available were ample to handle it easily, and during September, when the power was taxed to its utmost capacity."

	Division A.	Division B.
June overtime, per cent of total wages	1.8	2.0
September	5.3	4.6

"The increase in overtime is much faster than increase of business. A lighter tonnage would reduce wages as well as fuel consumption.

"Table showing economical train load and effect of change in tonnage:

MAXIMUM LOAD

75 cars, bituminous coal, gross	1,935 tons
45 cars, bituminous coal, net	1,215 tons
Wages of train and enginemen, 22 hours at $1.35	$29.70
Coal consumed, 17 tons at $2.87	$48.79
Cost of hauling, per ton of coal, wages	$2.45
Cost of hauling, per ton of coal, fuel	4.01
Total	$6.46

MAXIMUM LOAD

"Same train reduced five cars:

40 loaded cars, bituminous coal, gross	1,720 tons
40 loaded cars, bituminous coal, net	1,080 tons
Wages of train and enginemen, 17 hours at $1.35	$22.95
Coal consumed, 9 tons at $2.87	25.83
Cost of hauling, per ton of coal, wages	$2.13
Cost of hauling, per ton of coal, fuel	2.39
Total	$4.52

"The rating of engines is known to dispatcher, engineman and conductor, in order that they may clearly understand what is a full train load. The manifest, which shows of what the train consists, 'weight included,' is made up from the waybills by the agent at the point where the train starts and is given to the conductor, who registers the train in the ordinary manner, showing the gross tonnage on the register, and when the operator reports the train to the dispatcher the tons also are given, which the dispatcher likewise enters upon the train sheet. At the end of the run the conductor registers in like manner, which shows the tonnage into the terminal. This is also entered upon the train sheet and becomes a record, from which the dispatcher can figure and keep check on all his trains. The conductor, at the end of his run, encloses the manifest to the superintendent of transportation or car service agent, who compiles weekly statements, showing each and every train, over each and every division separately, for the week, or four times each month. A statement is made showing between terminals or runs, date, train, number or extra, and engine number, rating, rating out of terminal, rating into terminal, schedule

time of train, and time actually consumed in run. This gives each train, and the footing for the week shows total rating of engines, total tons out of terminals, total runs into terminals, and the average tons hauled to the average train load.

"These statements or sheets are for the information of the superintendent and train masters, to keep them advised as to what their trains are doing, and also for the manager and general superintendent. The superintendent of transportation, or car service agent, receives each morning yard reports from all points where trains are started and arrive, showing the number of trains out during the past twenty-four hours, the number of engines arriving during the same time, the total rating of the engines departing, and the total tonnage moved against the rating. The same report shows the number of loads left over after such trains have departed, and the general commodity. This enables the dispatcher and superintendent of transportation to check trains and know what tonnage was handled. If full tonnage for the number of engines was not moved, and there remained loads which would have given full tonnage, explanations are in order from the yardmaster or agents. This is the most effective check, as it is made generally while the train is moving, or while all the conditions are fresh in the minds of those concerned.

"Another advantage of the tonnage system is that the mechanical department is made responsible for the condition of the power; the engineer, knowing the rating of his engine, is expected to and must haul such rating. If his engine is not in condition,

he understands that he must report the fact in such a way as will absolutely protect him, for if he fails to haul according to rating, another engineer is placed upon the engine to determine the trouble. If he fails to haul rating after reporting the condition of his engine, the engine is taken out of service until put in shape, and so reported by the master mechanic. Too often, under the old method, the engineer was condemned for failure to perform satisfactory work with the engine, because he stood in fear of the roundhouse foreman, who may neglect to do the necessary work. By not having a check on the performance of the engine, it was allowed to remain in service when it should have been in the shop, and the engineer suffered such work to go on because he stood in fear of those directly over him, while the master mechanic knew nothing about it. Under the tonnage system, however, the master mechanic takes the tonnage sheets, checks up his engine, and then goes to the roundhouse register to see what has been done and reported. These statements of weekly work are of great value to the head of the mechanical department, even if not thought much of by his subordinates."

Sec. 76. Coal, Fuel, and Water

Many efforts have been made on the part of railway companies to reduce the cost of fuel and to secure a more economical use of it. Locomotive engineers are required on most roads to submit a statement of the coal that they burn and to justify any increase over the amount that is apportioned to their locomotives for their mileage. The fuel prob-

lem is a very difficult one, and on many roads it amounts to more than two millions dollars in the course of a year. In some instances no records are kept of this expenditure and little is known of the way in which it is used. In other cases coal premium statements have been developed, and these have in most instances proved very effective in securing a saving of coal. It is impossible to judge all locomotives in the same way, as the conditions of weather and service change the amount of fuel that is required. The best basis of judgment is the ton-mile cost, and even then, allowance must be made for the number of empty cars and loaded cars, side winds and wet weather.

The four tests for the value of coal are (1) chemical analysis, (2) the results of the calorimeter, (3) the test on small boilers, and (4) the test on the locomotive itself. The cost of firing is estimated at 6⅓ per cent of the cost of coal. Low grade coal shows a lower cost of firing than better coal, since there is more of it to handle.

The problem of water is one that confronts every railroad. Boiler troubles are general, and many experiments of different kinds have resulted in some remedies for the difficulties. It is now generally agreed that it is possible, by purification and softening processes, to produce a water that will be satisfactory for locomotives. The Union Pacific Railroad, which was confronted with great difficulty in securing satisfactory water, began first by piping and transporting water from thoroughly well-known supplies to as many neighboring stations as possible, second, by digging new wells and exploring for

good water, in order to develop a supply that could be relied upon, and third, by treating the waters furnished locomotives, to reduce the encrusting salts to a minimum, attempting to bring them wherever found to a uniform constituency so far as possible. The results obtained were very remarkable. In making a report upon it the engineer says that by piping the water the situation at the east end of the line was remedied, and by treating and redistributing the water in the middle territory it was possible to make it uniform with that at the east end. Under the old conditions the life of a flue was from four to six months. Since the experiments have been made and the changes introduced, the life of flues has been increased to eighteen and twenty-four months, and there are some instances of where locomotives have actually been in service for two years without any boiler trouble. At the present time the Union Pacific has plants capable of treating more than 500,000 gallons per hour. The chemicals used to secure these results have been soda ash and tri-sodium phosphate.

In their report, the American Railroad Master Mechanics' Association says that by using purified water it has been possible to secure better service and greater mileage of engines, and to increase the life of flues and fire-boxes from 50,000 to 150,000 miles. In the specific case of one road the pay-roll of boilermakers was reduced more than $75,000.

Sec. 77. The Cost of Maintaining Locomotives

The variance in practice, on the part of railroads, in making charges for the repair of locomotives,

materially affects the uniformity in the accounting systems and vitiates to some degree any comparison of the cost of maintenance of locomotives. Locomotive repairs vary from $1,000 to $3,000 per year, and from $3 to $10 per 100 miles. An engine in heavy freight service must receive a certain amount of attention at frequent intervals; at from 100 to 150 miles various parts must be readjusted and slight completed general repairs are needed, while after 70,000 to 100,000 miles the whole machine must be overhauled and put in good repair, often being rebuilt. "The expense of repairs for an eight-wheel locomotive in the freight service is almost invariably less than for ten-wheel Moguls or consolidated engines, and the road which has a plentiful sprinkling of the latter in its equipment is certain, all other things being equal, to show a higher cost for repairs per engine mile; if the records were made up on the ton-mile basis the result might be quite different. * * * The time of a train scheduled to make one hundred miles in four and one-half hours, with six cars and twenty-seven stops, was reduced to four hours, and immediately the fuel bill for that train was increased $100 per month, with the same engine and the same men. When the running time was changed back to four and one-half hours, the fuel record at once dropped to its old figure. On the same road it is found that the eight-wheel engines in fast passenger service cost more for repairs than ten-wheel engines in ordinary freight service, and no amount of care will bring the expense of the fast eight-wheel engine below the slower

ten-wheel. The average cost for repairs is also greater on those divisions where train speeds average the highest." It has also been found that eight-wheeled engines in fast passenger service cost more for repairs than the ten-wheeled engines in ordinary freight service, and no amount of care would bring the expense of the passenger engines below the slower ten-wheeled ones.

High cost for repairs is sometimes brought about because of the attempt to do the work at small shops where the facilities are inadequate. Where the repairs are low, the shops in size and number fit the conditions of the road, and the engines are in or out of service for long or short periods, depending upon the stock of standard parts ready at hand with which to make repairs. The use of scrap for repairs on special parts is a science in itself, and railroads are beginning to appreciate the value of scrap accounts and the wisdom of maintaining careful records of all repairs and replacements on locomotives.

Sec. 78. The Pooling of Engines

In the old days of railroad management, locomotive engineers were given engines to take care of and to operate, and the man assigned to a locomotive was expected to take care of it and run it. This system has been found inadequate to meet the needs of modern railroading, and especially because, in such cases, locomotives wait on individuals when they might actually be put into use. Today therefore it is customary to pool the engines, turning over a number of engines to a group of men, who take them

in order or as they happen to come in. From the point of view of efficiency, however, it may be doubted whether pooling produces the best results. The men do not know their engines so well, and in consiquence cannot get so much power out of them. They are not interested in taking care of the small repairs, and the road is put under the necessity of more frequent and more careful inspection. It is suggested that in place of pooling, a system of double-crewing engines would be more satisfactory, so that forty-five to fifty days a month could be gotten out of an engine by the use of a double crew, which is all that can be expected, and at the same time there would be a saving in power and an interest in the locomotive which is not the case under the pooling system now in vogue on many roads.

Sec. 79. Cars and Safety Devices

The long car now in use on the railroads of the United States was not adopted until 1880, when its capacity had reached twenty tons and its length 34 feet. Little by little the capacity of the car has been pushed up, until to-day it is as great as fifty to sixty tons, while the length has not materially increased. The first long passenger cars, with center aisles and end doors, were built in the United States about 1833, and this type has been adhered to ever since that date. Improvements of different kinds have been made in the passenger coach, by the addition of the Miller platform, the coupler and buffer, the vestibule, and the air-brake. Until 1896 passenger coaches, and freight cars too, were constructed wholly of wood, the iron and steel in them being

used only for bolts and rods. The first all-steel freight cars for regular traffic were built in 1897 on the Pittsburg, Bessemer & Lake Erie Railroad. They were of the hopper type and of 50 tons capacity. The advantage of steel construction at once made itself apparent, in that a wooden coal car of 44,000 pounds capacity had a dead weight of 22,000 pounds, while a steel car of 55 tons capacity had a dead weight of 36,500 pounds. The relation of these figures to each other is shown further in the statement that the dead weight, which had been one pound for every two pounds of load, had been cut down by the use of steel cars to one pound for every three pounds of load.

One of the problems in the construction of cars has been the determination standards for the different forms of equipment that were necessary for the building of rolling stock. The Master Car Builders' Association was formed in 1867, and through its work standards have been determined for steel treads and flanges, journal boxes, bearings, automatic couplers, brake beams, draught attachments, and the like. The adoption of these standards has materially bettered the movement of cars and greatly aided the development of traffic between different roads. Many safety devices have been introduced as features of train equipment, such as the newer forms of air-brake, air signals, and automatic couplers for freight trains. These have made life safer, both in traveling and in the conduct of transportation.

The mechanics of railway equipment are intricate and difficult. This chapter has merely hinted at

some of the broader features, and the student who is interested in the more detailed phases would do well to consult the many excellent reports found in the volumes of the proceedings of the Master Mechanics' Association and of the Master Car Builders' Association.

Not only have the last 15 years brought a great improvement in locomotives in the way of increased capacity, but also a very creditable improvement in increased efficiency, due very largely to the influence of superheating apparatus, mechanical stoking, and improved conditions of combustion in the fire-box, due to the influence of the brick arch.

A late development (1921) that has demonstrated the ability to still further improve these results is the practice of locomotive feed-water heating, a subject in which the railroads are manifesting a great deal of interest. The open-type heater especially, as indicated in the report on the subject of Locomotive Feed Water Heating, read at the 1920 Convention of the American Railway Association, Division V—Mechanical, is particularly promising. It has long been recognized in stationary practice that an increase in the boiler-feed temperature of 11 degrees is equivalent to a fuel saving of 1 per cent. Since locomotive feed-water heaters are showing a temperature rise in the feed of from 150 to 170 degrees, it will readily be seen that a further improvement of from 12 to 15 per cent in the operation of the modern locomotive is imminent.

CHAPTER IV.

THE FREIGHT SERVICE

Sec. 80. The Importance of Freight Service

The old saying that the passenger service pays for axle grease and the freight traffic makes the dividends, still illustrates the relation of the two, though the difference in earning power is by no means so great as it used to be. Of all the earnings reported by railroads in 1907, 70½ per cent were contributed from the freight traffic, while the passenger business formed but 22 per cent of the earnings of railway companies. The total receipts from the freight business of the different railways of the United States amounted, in the year mentioned above, to two billion dollars. The movement of commodities has been greatly increased as the population has grown, and in addition to this natural incentive to its development, a marked increase can be traced to the organization of production in all fields of endeavor. The broker in the grain trade has been eliminated, and the elevators are now owned by great firms with large capital, who are able to place the supplies of grain in their hands in any part of the world where it is most wanted. The live stock that used to be driven on foot to the market is now carried by cattle trains, and the purchase of beef animals is managed through representatives of great cattle houses, who act as the direct shippers of cattle

to the central market. Cotton also is now collected in vast warehouses and redistributed by rail to the manufacturing centers. So the enumeration might be continued, with increased evidence of the development of transportation through the organization of industry.

When distributed over the different classes of commodities, it is found that of the nearly nine hundred million tons of freight reported by classes as originating on the different lines of railway in the United States, the product of the mines contributed 53.39 per cent. Next to this were the manufactures, amounting to 15.41 per cent; then came the products of forests, 11.38 per cent; agriculture, followed with 8.62 per cent; miscellaneous items, 5.02; merchandise, 3.89, and the products of animals, 2.39 per cent, completed the list.

Sec. 81. Equipment for Handling Freight

A good deal of discussion has arisen in recent years regarding the use of large or small cars. The tendency has been in the direction of increasing the size of the cars, because of the decrease in ratio between carrying capacity and dead weight. The emphasis upon this development has been largely from the point of view of mechanical power, since the use of heavy cars reduces the number of them in the train, and tends to increase the density of traffic, which is highly desirable from the point of view of reducing train mileage. Looked at from the side of the general operation of the railroad, it appears not only that large carrying capacity must be limited by the conditions of traffic, but that the

wear and tear on the cars, together with difficulty in handling unwieldy trains, is likely to interrupt and interfere with the easy movement of freight. There can be no doubt that in America the tendency to use large cars has been especially favored by the enormous amounts of coal and raw materials which can be transported in unbroken train loads over long distances. The tendency toward the centralization of production and the concentration of markets have also been contributing factors in the growth of the number of heavy cars. Unquestionably, however, the limit of the practical uses of heavy cars has been reached in America, and it is undoubtedly true that no general rule can be stated regarding the size of cars, since that must depend, necessarily, upon the character of the traffic along the railway line.

The cars now in use in America are known as box, flat, stock, coal, tank, and refrigerator cars, with a considerable number of miscellaneous types that are used for special purposes. The Interstate Commerce Commission reports a total of 1,986,017 cars engaged in freight service in the United States. The largest number of these, 802,187, were in class six, having a capacity of 60,000 pounds; the next in order was class eight, cars of 80,000 pounds capacity, of which there were 452,070; and the third group consisted of the cars in class ten, with a capacity of 100,000 pounds, the number in this group being 285,241. From these figures it will be seen that nearly three-fourths of the cars employed in the United States were large capacity cars, ranging from 30 to 50 tons in capacity.

Sec. 82. Classification of Freight

Speaking broadly, freight is classified in accordance with (1) quantity, (2) distance carried, (3) time, and (4) value. Under the first group a distinction is made between carloads and less than carloads, designated by C. L. and L. C. L. In the second class the distinction made between local and through freight is one which in a measure is a distinction of distance, though not always necessarily so. Distinctly local freight is that which originates and terminates on the same line. Through freight is freight which, originating on one line, is designated for some point beyond it. Thus, freight sent from Spokane to Minneapolis on the Great Northern is local freight, but if sent from St. Cloud to Winona it becomes through freight, since it leaves the Great Northern at St. Paul and is transferred to another line at the Midway transfer. Under the third head freight is classified as quick dispatch freight, time freight, and ordinary freight. The quick dispatch freight is sent under special bills of lading, and travels by fast trains over a designated route. Time freight is freight that has been guaranteed in its delivery, such as fruit from the Pacific Coast, or valuable animals sent to distant cities. Ordinary freight is that which goes by the usual means without special provision for its delivery.

The classification of freight is a matter which has tested the wisdom of many individuals and of numberless committees. The three general classifications existent in the country are known as the Eastern or Official Classification, the Southern and

the Western. In the early days the railroads made their own classification of freight, and transferred at junction points the freight that went beyond their line. The difficulties of adjustment, the question of charges, and the constant claims that were made forced some recognition of the relations of railroads to each other, finally resulting in the organization of the various traffic associations for the purpose of making classifications through the medium of a committee upon which were representatives of each important railway company. The Southern classification committee had its origin only in 1899. Under the system adopted by this organization freight is divided into from five to nine classes, and the rates made by each railroad for articles in a given class are the same. The principle determining the classification of freight is the general one of ability to pay, though the weight, bulk and cost of transportation have some minor influence. In addition to the regular classes, there are many heavy commodities, usually moving in carload lots, that are given special rates, called in railway language "commodity rates." The theory regarding these commodities is that they could not afford to pay the regular classified rates, and consequently, if moved at all, must be put upon a special basis. In the main each railroad determines what goods shall be transported under commodity rates. It is the practice of some of the roads to make another group of rates, always low, on goods destined to foreign countries by ocean routes and also on imported goods from foreign countries to interior points. The justification for these rates is, in the case of the exports, that

it makes possible the placing of American products in foreign markets at low cost, and in the instance of the imports, that we should meet the competition of water transportation by foreign countries. It is the practice of railroads to make lower rates on goods carried in carload lots than on those shipped in smaller quantities, and the difference in some instances is greater than the mere difference in the cost of handling would seem to justify.

Sec. 83. The Movement of Freight

The shipper who desires to forward his products to market leaves his order with the station agent for cars, and the agent notifies the train dispatcher of the need of cars at his station. In a day or two the car is set on the siding and designated for the use of the shipper. When loaded, a bill of lading is made out, on which is set forth the name of the shipper, the station, the consignee, a description of the articles, the weight and route of the car, with its initials and number, and the class and rate at which it is accepted. This bill of lading is negotiable, and is often attached to a draft drawn upon the consignee by the consignor, and accepted by a bank as collateral for loans, or in some instances is actually purchased by the bank. If the freight has no great value, the agent issues to the shipper an ordinary freight bill, copy of which is kept by the station agent and forwarded to the agent at the station to which the freight is destined, and is there handed to the shipper. For every shipment that is received the agent makes out what is called a way bill. The way bill is in reality a record of the route

and description of the car, by which it is possible for the train men to know the history of the shipment. The memorandum way bill designates the initials of the car and its number, its destination and route, the weight and loading, together with the name of the consignor and consignee, the capacity of the car, and the gross tare and net weight of the shipment. This is given to the conductor of the freight train. In addition to the way bill is a way card, setting forth all the information indicated above, together with a statement of the class, rate, freight charges, and amounts to be collected. A copy of the way bill must be sent to the company's auditor of freight receipts. The card way bill is intended for the depot freight agents, who give orders regarding the movement of the car. But besides the copy of the way bill which the station agent sends to the auditor of freight receipts, he is required in addition to make a daily and monthly report to the auditor of local and through traffic. The weighing masters at the stations are also required to send daily statements of the weight of all shipments to the auditor as a check against the station agents. After receipt of the way bill the receiving station makes a report on the arrival of the goods and sends it, together with several freight bills, and an abstract, to the cashier, who enters the amount of freight each consignee has to pay on his ledger, and the ledger must harmonize in all its details with the daily accounts made up in the office from the freight accounts. Besides the daily and weekly statements of receipts, delivery certificates are made out, through which checking of accounts can be thoroughly done. Carbon copies

of every way bill are made for the different railroads participating in the movement of the freight.

The movement of high class or fast freight is carried on under what is known as the manifest system. Certain types of commodities are eligible for transportation in fast freight trains. These are perishable goods, such as meats, dairy products, and merchandise, and in the case of time freights, sugar, rice, coffee and machinery. A manifest freight train, like a passenger train, moves on a definite schedule, approximately twenty miles per hour, while a time freight makes its way over the line at about twelve miles an hour. The rate on manifest freight is naturally higher than that paid on time or ordinary freight, since the increase in the speed of the train decreases the pulling power of the locomotive. The freight way bills used for manifest fast freight are printed in red and those of the time freights in blue. This is done in order to distinguish them from the ordinary way bill. The yard clerk designates fast freight and time freight cars by small cards tacked on the sides and doors of the cars corresponding to the colors of the way bill. These cards draw attention to the car, and the colors being well known by yardmen and trainmen, any delay is at once noted and the car sent on its way. The cars intended for fast and time freight are collected in one place in the yard and made up into a train, with the cars so arranged that they can be set off easily in the order of the towns to which they go. The movement of the train is watched as carefully as that of a passenger train. A board in the office of the superintendent shows the number of cars designated for the

different points, and as the train proceeds the superintendent receives reports by telegraph of the arrival of certain manifest cars. This is followed up until the train reaches its destination and the cars are located at the specific stations for which they were originally intended.

The problem of routing freight is a very important one. It depends upon relative distances, grades, traffic movement, facilities, and on what is the direction of the general freight movement. Under modern methods of organization large wholesale houses have their special routing officers, who by careful study of time-tables and traffic conditions are able to secure the best service for their business concerns.

The difficulties of routing a loaded car are much increased when the freight is in less than carload lots. Then it becomes a matter of getting the freight properly grouped in cars and of seeing that it is transferred at the terminal stations to the best carrier, if it is through freight. The railroads endeavor to facilitate its movement and to save time by loading the freight in the order of the stations; in other words, placing the freight for the last station in the end of the car. Only long experience in the routing of cars and careful study of freight movements makes it possible for the traffic officers to load freight in the way that will be most productive of economy of time and effort.

Questions arise occasionally as to the scheduling of freight trains. One authority in speaking of the matter states that only such trains should be shown on the schedule as will make immediate connections and take care of local freight. All other trains, in

his opinion, should be run as extras, since the scheduling of trains at frequent intervals means insufficient tonnage, half loads, and the expanding of train mileage, for which very little revenue is forthcoming. The result is to increase cost per ton mile for all of the tonnage that is handled. It appears also that operating officers are not likely to pay as much attention to schedule trains as they do to extra ones, knowing that when an extra train is sent out there is a sufficient tonnage at hand to pay for the mileage. A small number of trains on the time card would thus produce better results, in that every dollar spent by the railroad company would be for the purpose of actually transporting business that was all ready to be taken care of. From this point of view, every train would be run at its full carrying capacity except those engaged in local traffic. Moreover, the movement of trains should not be associated with that of empty cars. It cannot be claimed with any justice that the movement of empties to supply a demand is economical and businesslike when a few pounds of local freight is carried in the cars. It costs money to stop freight trains, to switch cars, to open doors and handle freight, and the use of empties to carry scattered items is a costly one, which is not to be justified when the wages of crews are taken into consideration. The movement of empty cars is over 28.35 per cent, as against a possible 25 per cent. Economy, therefore, points to loaded cars and small numbers of empties. The manifest train, spoken of above, is the best example of an economical train, since the amount of freight, rating of the engine, and tonnage of the cars are all

known to the dispatcher before the train leaves the station. If this same principle can be applied to the movement of ordinary freight, it will mean a marked increase in the earnings per train mile and a very considerable decrease in the cost of operation per ton per train mile.

Sec. 84. Fast Freight Lines

In order to meet the difficulties that arise from the movement of cars from one line to another, railroads developed at a rather early date special freight lines, capitalized and organized by representatives of the railway, and owning numbers of cars that were devoted to the movement of freight between certain cities. The trains were supposed to move at a higher rate of speed than the ordinary freight train and to reach their destination in a given time. The Empire Transportation Company was organized in 1865 to operate on the Pennsylvania Railroad. Other corporations, such as the Globe Fast Freight Line, doing business over the West Shore, the Nickel Plate Fast Line National Dispatch, operating on the Grand Trunk, and the Great Southern Dispatch Line, a coöperative organization in the interests of the Pennsylvania, Norfolk & Western, the Cumberland, the East Tennessee, Virginia & Georgia, the Shenandoah Valley & West Maryland railroads. This line moved trains between Boston, New York, Philadelphia, Baltimore, and towns east and north of Harrisburg, and south and west of Bristol, Tenn. Other lines, like the Empire, the Merchants Dispatch, the National Dispatch, and the Union Line are known wherever railroads are engaged in business. The

consolidation of railroads, in the last few years especially, has offset the necessity of fast freight lines of the private corporation type. These independent concerns often work to the disadvantage of the railways, in that they divert to their own coffers profits which really belong to the stockholders. As a result of this difficulty there has been brought into existence what are called coöperative freight lines, which are created by joint agreement of several railway companies. The different companies furnish a number of cars proportionate to their mileage, and a manager is put in charge of the line, who has under his direction agents at the different cities to solicit business and to report the movement of freight. The earnings above expenses are divided among the roads coöperating in the conduct of the freight line. This method of dealing with inter-line traffic has been found to be very satisfactory and prevents much of the discrimination and unsatisfactory condition that existed under the old privately organized and owned special lines. As the railroad business has bettered its organization the necessity of the special freight line has been questioned, but the habits of shippers have accustomed them to the trademark and methods of the freight lines, and their continuance is more a matter of business policy than of economy in management. But while the decline of the special freight line has been quite marked in the last fifteen years, nevertheless the private car belonging to large corporations has come into greater prominence until it is regarded in some quarters as an actual menace to the stability of rates and fair treatment to shippers. The American railroads own

about 35,000 refrigerator cars, and one corporation, the Armour Company, owns 15,000 special cars of the refrigerator, tank and stock type. The method of using them is for the owners of private cars to negotiate with the railroads or with the special freight lines for the movement of the freight. The companies become real competitors of the railroads in that they place their cars in use for the shipment of fruit, ice, and other materials, letting them out whenever they are not in use by their owners. In the earlier stages of this enterprise the railroads charged them freight the same as other shippers, and they were required to pay upon the movement of their empty cars. When, however, the concerns became great and powerful corporations the railroads were forced to pay the shippers for their private cars, and of late years even for the empty runs. The competition with the ordinary shipper and the owner of private cars became as a consequence greatly disturbed by the favors secured by private car owners.

Refrigeration and cold storage are associated together in the development of a great freight business. The first refrigerator car was built in 1868, and the success of it for the movement of fruit was so well assured that the business of shipment in cars of this type developed very rapidly. However, few railroads owned any refrigerator cars. As stated above, all the railroads in the United States own but 35,000. The period of the need for transportation of this type is limited in any one region, and when cars are owned by private companies, it is possible to send them by hundreds and thousands from place to

place to meet the seasonal demands. In consequence, only a railroad system of very great extent could keep cars of this type in constant service.

The charge made for refrigerator cars is one cent per mile west of the Mississippi and three-quarters of a cent per mile east of the Mississippi. It has been stated that the returns from the operation of a refrigerator car in the course of a year are sufficient to pay for its construction. Such matters, however, take us into the field of controversy, and as the purpose of this book is simply to set forth conditions, further comment at this point seems undesirable. The owners of foreign cars on a railway now receive six-tenths of a cent per mile for their movement, loaded or empty. The tendency is to make a charge of forty cents per day, regardless of the movement of the car. There is no penalty, however, for the length of time that a foreign car is used by another railroad, except that the failure to return the car within twenty days after notice results in a fine of eighty cents per day added to the regular forty cents charge. The railroads have always met the difficulty by prompt loading and unloading of trains, but a general charge is now made of $2 a day after a limit of forty-eight hours. In some instances, as in the case of wheat, the time is extended to five days.

Sec. 85. The Distribution of Cars

The distribution of cars to meet the demands of traffic is a difficult problem. Weather conditions, strikes (as well illustrated in the recent strike in the Northwest) and the crowding of terminals, hinder the movement of freight. Under the present method

the managers of railroads attempt to keep themselves thoroughly informed of the conditions along their lines. Station agents send reports of crop conditions and estimates of cars probably needed for the movement of grain. In time well posted managers come to know what the regular demands will be and are able to meet them without difficulty. Mr. J. W. Midgely, formerly chairman of the Western Freight Association, in a paper appearing in the Railway Age, on the decline in freight car performance, states that some nineteen causes can be assigned for this decline and for the difficulties which confront the manager who is attempting to secure the most satisfactory adjustment of his tonnage capacity. (1) The increase in local business, by which long hauls are reduced and the railroads compelled to put in more siding for unloading; (2) the delays at division points in terminals, due to increase of business demanding additions to equipment and enlarged terminals; (3) the increase of cars, which has more than kept pace with the growth of tonnage; (4) the quadrupling of the capacity of cars, thereby reducing the mileage to be performed; (5) retention of old and small capacity cars in face of the fact that shippers prefer modern equipment; (6) delays occasioned by permitting shippers to consign freight to order, practically converting cars into storehouses while awaiting consignment; (7) delays from changes in consignment in transit while awaiting instructions from consignors; (8) the holding of cars outside of car service jurisdiction in order to escape demurrage charges; (9) delay in weighing cars which are held for home routing or return loading; (10) the delay

occasioned by the holding of cars for fuller loading due to the demand for larger train tonnage; (11) allowing cars to run through and be diverted to local use on foreign roads, compensation for which is sometimes withheld; (12) the failure to make a full report of car mileage while away from lines of the owner; (13) the exemption of house freight and other traffic from car service rules at commercial centers, while shippers' associations are under no obligation to return cars promptly; (14) delays at lake and seaboard through the necessity of assembling large cargoes, especially for export, and the demand for cars in order to enable ships to unload promptly, vessels being entitled to demurrage for detention; (15) the increase of belt lines and other railroads that own little or no equipment and their appropriation of foreign cars to conduct their local traffic, and the fact that, their lines being short, they refuse to pay any mileage claims, on the ground that they are engaged in switching; (16) the charge for the use of foreign cars is so small that borrowing roads prefer to secure equipment in this way rather than to purchase it; (17) the increase in private cars which have absorbed the long haul and perishable freight traffic; (18) the cutting of car usage by the existence of transfers, and insistence upon transfers when no empties are to be had, thereby detaining loaded cars, when they might have continued to their destination and been returned; (19) the need of common control, so that during car famines empties on sidings can be utilized.

In the opinion of the writer from whom this long list of influences has been quoted, too many new cars

are being built without taking out of service the old ones of smaller capacity. The carrying capacity of cars has been increased 400 per cent in twenty years, but the increase of the load has only been 70 per cent. Betterment in the methods of car service to the extent of 25 per cent only would reduce the number required to not less than 275,000, which capitalized at $500 a car would mean a capital charge of $137,-500,000, the interest upon which, together with the depreciation, cost of maintenance and the like, could well be saved. There is no question but that great economy could be effected through more careful management of freight car service.

In this respect the railways of the United States are far behind those of Europe, where clearing houses have been established for a great many years. A clearing house does away with the multiplied systems of railroads, expedites movement, minimizes the collection of charges, simplifies the accounting, and concentrates the preparation of statistics and other information for railroads. The plan has long since passed the experimental stage. The system is used as though all of the roads belonging to the organization were one road. It has no financial function, all monies being remitted to the treasurers of the respective roads direct. It is merely a branch of the auditing department. The accounts of each road are kept by themselves, and through this medium a minimum amount of business relating to the interchange of traffic can be transacted in a way satisfactory to all the roads. Speaking of the Buffalo organization, Mr. Mikkleson, its manager, said some years ago that in the two years since its organiza-

tion the revenue cleared between the membership roads was thirty-four million dollars in round numbers, the total number of tons ordered and received from stations, divided into sixty commodity classes, amounted to $9,626,994, while the total number of way bills was more than one and a half million. Some movement toward a better understanding between railroads is to be seen in the use of uniform way bills and a clearer understanding of the rules and regulations regarding the routing of freight.

Sec. 86. Terminals

A terminal has been defined as that subdivision of the permanent way where traffic is handled at the point of origin and destination. Broadly speaking, there are three types of terminals,—the local or way station, consisting of a few tracks and a building in its simplest form devoted to waiting rooms, station office and freight room; the intermediate terminal found at all divisional points, and often large and well equipped for the receipt, delivery and transfer of freight; and the final terminal at the end of the road, where are the general offices, shops and other facilities for carrying on transportation. Terminals may be what are called independent or combination. The combination terminals are those devoted to the handling of both freight and passenger traffic; independent terminals are special ones given over to the business of one kind of traffic. The freight terminals of a railroad consist of freight yards for freight cars and locomotives, freight stations, team tracks, industry tracks and water terminals. A freight yard is divided into different yards,

known as receiving yards, classification yards, departure yards, repair yards, and storage yards. The receiving yards contain tracks for storage and for unloading goods. In terminals they vary from 75 to 90 cars in length. The classification yard is one in which the cars are grouped in accordance with their freight or train. These yards are known as level, poling and hump yards, depending upon the method that is used in moving the cars from place to place. The level yard is one in which the cars are shunted, in the poling yard the cars are pushed from place to place by poles placed on the cars and against the locomotive, and the hump yard is one in which an incline is built upon which cars are pushed by a locomotive and then directed by gravity to the different parts of the classification yard. The use of this last type facilitates the movement of freight and makes classification less expensive than in the other ways. The departure yard is where the freight trains are made up, and it is large enough to hold from 45 to 90 cars, depending upon the amount of the traffic. The repair yard is described by its name, and the same is true of the storage yard.

A considerable literature has been developed regarding the planning of yards and the best practice in the movement of freight. The terminal question is so important that much study has been given to the planning and location of freight terminals.

The freight stations consist of freight houses, transfer houses, warehouses, elevators, platforms, stock-pens and the like, and in the larger places inbound and out-bound freight houses are provided for the easier movement and classification of freight.

Railroads which have water terminals build enormous elevators and warehouses for the quick and easy movement of freight, grain and merchandise.

The policy of railroads towards terminals is one which has a marked influence upon their development. In some instances railroads rent the use of terminals, possibly building a freight house for the receipt and dispatch of their own traffic, but relying upon another road for the use of trackage. A policy of this kind may for the time being save the road from some pecuniary embarrassment, but in the long run the expiration of the lease may mean the practical annihilation of the road's business because of its inability to secure satisfactory terminals to handle it. In other instances holding companies have been organized by two or more roads for the purpose of controlling the terminals. This is more particularly true of union stations in connection with passenger business, and in the case of railway companies competing with each other the tendency is to own their own freight terminals, where they can provide all the necessary facilities for handling their business.

The discussion of passenger terminals will be left to the next chapter.

CHAPTER V

PASSENGER, EXPRESS AND MAIL SERVICE

Sec. 87. The Growth of Passenger Traffic

In late years the passenger service of the United States has grown by leaps and bounds, reaching in a recent year the large figure of nearly nine hundred millions of passengers. Each one of these travelled an average of 32 miles. Applying these figures to the population of the United States, it may be said that a journey of more than three hundred miles was undertaken by every man, woman and child in the country during the year. This, of course, was not actually the case, but the travelling done in the United States during the year was extensive enough to make this average. The revenue earned amounted to $1.25 for each passenger train per mile, and the rate paid by the passengers was 2.14 cents per mile. The passenger revenue for the year was $564,606,343, an increase of more than fifty millions over the preceding year, although the proportion of such revenue to the total earnings of the operation of the railroads was slightly less than it was the year before.

Sec. 88. The Passenger Department

In dealing with the travelling public, the railroad has a greatly different problem from that which confronts it in the handling of freight traffic. The passenger has what freight has not, initiative and

discrimination. The consequence is that the passenger department is compelled to deal with many problems that do not concern the freight division of the railroad business at all. Trains must be run at greater speed, comfort must be assured, regularity secured, and safety guarded whenever trains are moved. In fixing the train schedules, the convenience of people must be considered as well as the regular departure of trains. The department is compelled to coöperate with the freight division, since the two affect each other in the work that they are doing. This is especially true in a pioneer country, where enterprises must be fostered during the early years of the railroad's history. The freight department must move materials, machinery and equipment at the lowest possible cost, and the passenger department must coöperate by furnishing trains that will provide for transportation at times convenient for the development of travel to the towns and villages by prospective purchasers. It is, therefore, not arbitrary action on the part of the passenger department that determines the movement of its trains in many instances, for as shown above, it is necessary to consult not only the wishes of the freight department but the needs of the people in the territory through which the road passes. The attitude of boards of directors toward the passenger business varies with different railroads. In the thickly settled parts of the country, considerable attention is paid to the movement of passenger trains. On transcontinental lines also, where through traffic can be developed, the equipment and facilities offered to the public are of the best; though oftentimes the atten-

tion of the department is so concentrated upon the through trains that little provision is made for the movement of the local traffic.

The passenger department is that division of a railway's organization which devotes its time and energy to the care of the passenger traffic. It is under the direction of the General Passenger Agent, who in some rare instances is a vice-president of the railroad, though usually he is under the direction of the General Manager. On the larger roads the departmental organization consists of a rate bureau, an advertising bureau, an immigration bureau, a baggage department, a commissary department, a mail bureau, and an express division. The matter of rates so far as departures from official agreements are concerned is determined by the head of the department, and the bureau of that name is largely an information bureau which keeps informed upon the various changes that are taking place in passenger rates. The advertising bureau is an important one, in that through solicitors and attractive literature it is possible to divert passenger traffic to the line. The old method of paying for advertising by transportation has in a considerable degree passed away, and advertising experts are now engaged to organize the publicity side of the passenger business, a fact that accounts for the large increase in the number of attractive folders and booklets now issued by railway companies. The immigration bureau is organized for the purpose of encouraging immigration along the line of the railway company, and the head of such a division is often town site agent and acts in the double capacity of encourager

of emigration and agent for the sale of the lands of the company. On some of the western lines this bureau has been developed to a very high degree of efficiency, employing soil and agricultural experts, who through lectures, circulars and conversation attempt to present the opportunities along the line of the railway. Where this work has been done intelligently and honestly it has been of great advantage both to the railway and the country.

The baggage department is described by its name, and little need be said concerning it at this point. The commissary department has charge of the sleeping and dining cars, and where the road operates them, the hotels and restaurants. Sometimes the commissary department is turned over to some expert hotel man who resides in the terminal city, and he makes the purchases of supplies upon a ten per cent commission. This method of carrying on the work of the commissary department has, in the instance of the small roads, proven very satisfactory.

The mail and express divisions require a certain amount of oversight in carrying out the railroads' part of the contracts, and usually such duties are allotted to the passenger department, since the movement of both mail and express is by the passenger trains.

Sec 89. The Passenger Service

The passenger service is divided into what is known as through, local and suburban. The through traffic is that which moves from one terminal to another; the local traffic is the movement of pas-

sengers from station to station, and the suburban traffic is the movement of passengers in and out of large cities within a radius of sixty or one hundred miles. To these three types of service is sometimes added a miscellaneous one consisting of excursions and immigrant trains, which do not technically come within any of the three classes of passenger traffic cited above, since the movement is by extra trains especially arranged for. Passengers are classified as Pullman, first class, and second class. The Pullman passengers consist of a rapidly increasing group of persons who resort to the Pullman car when they travel. They pay, in addition to their first-class fare, the Pullman charges. The second-class passengers are those who receive a somewhat lower rate than the first-class passengers, and their accommodations are usually confined to the smoking car, or to what are called immigrant coaches.

Sec. 90. Tickets

The ticket problem is one to which the railways of the country have given a great deal of attention. Attempts have been made to create a ticket which not only could not be easily counterfeited, but which in addition would provide for the identity of the passenger and protect the railway company against possible collusion of travellers with ticket agents and conductors. The types of tickets are numerous. Reference can be made here only to a number sufficient to illustrate the purpose and care of the railway companies. The ordinary ticket issued for local traffic is the card ticket on which is printed the name of the issuing station and the destination. The book ticket

is also used on some lines because it eliminates some of the expense of printing and at the same time is unusually convenient in meeting the needs of ordinary traffic. This form of ticket has a blank on which can be written the name of the destination of the passenger. Coupon tickets consist of small coupons on which are designated the length of the ride and the destination of the owner. To regular travellers on suburban lines a commutation ticket is issued. It is usually a card on which is designated the number of rides to which the passenger is entitled, the conductor cancelling the number of rides used from trip to trip. The inter-line ticket is issued in conjunction with other railway companies. On it will be found automatic provisions for the time limit, the appearance of the traveller, and the conditions under which the journey is to be undertaken. By the use of the paster and extension the railway companies are able to furnish these tickets to practically any destination on the railroad, steamship or boat lines of the country. The mileage ticket has increased in popularity, and as interchangeable mileage has been provided for by many of the railways, it has come to be looked upon as a favorite form of transportation. It is issued in one, two and three thousand mile books, the purchaser usually paying the regular rate for it, and receiving upon the return of the cover, a rebate, the amount depending upon the mileage of the book.

The method of handling tickets has been a great problem. For years the railway companies have struggled against ticket brokerage, and have, to a considerable degree, been able through their agree-

ments with each other to materially cut down this business. Its origin was with the railways themselves in the competitive days of the '70s, and it was continued by them until well along in the '90s. Passes have always been one of the problems of passenger service, the liberality with which they were issued, not being counted as an expense against the department office, caused an enormous increase in the passenger business without materially affecting the receipts of the company. Despite the provisions of the Interstate Commerce law and the legislation of the various states regarding the issue of free transportation, there is still no question but that five per cent of the passenger business of the United States is carried on passes of one kind or another.

On many roads provision is made for the daily accounting of ticket sales. In each station agent's office in the larger cities a complete tabulation of the sales of tickets is made, and this is sent to the auditor of the company; notwithstanding this provision it is difficult to secure a check on the collection of conductors on trains. The use of the automatic receipts given to the passenger when cash is paid has in some measure met this difficulty, but the railway company is compelled to rely upon the honesty of the train conductor to a large extent. On some roads a train auditor has been introduced, not so much as a means of checking the conductor, as for the purpose of relieving him from the details of ticket collection, so that he can give his whole time and attention to the movement of the train. In some instances the passenger department employs train auditors, not as regular collectors, but as occasional collectors of

tickets, so as to be able to check the receipts of the train from time to time. It is the custom of most railways, as indicated above, to require a daily account of ticket sales, and in addition to this a monthly statement which must be sent to the auditor of passenger receipts. The conductors are also called upon to prepare daily cash and mileage reports and to furnish monthly statements of the money they have received. These reports go to the auditor, and at the larger stations to the ticket receivers, who transmit the various accounts to the auditor.

The examination of the accounts and the comparison of them with the tickets require a very considerable amount of work. On the Pennsylvania Railroad the accounts and statements amount to about one thousand each working day of the year, requiring a large force of employes to carry on the work. On some of the German roads the method of caring for tickets is quite as effective as with us and much more economical, necessitating a much smaller number of employes to accomplish the work.

Sec. 91. Baggage

American railway companies carry 150 pounds of baggage without charge for the holders of first and second class tickets. In order to do this there has been developed a simple but effective system of checks, by which the baggage of the traveller is quickly identified when he presents the duplicate check. The method in use in Europe is distinctly different in many particulars. In England the traveller either carries his baggage with him in the compartment or identifies it at the end of his journey

in the baggage van. On the continent two systems are in vogue. One is somewhat similar to the check system existing in the United States, where duplicate paper pasters are used. One of these is placed upon the baggage, while a corresponding number is retained by the passenger. The second method is to consign the baggage in much the same way as express and freight packages are sent, a bill of lading being made out in the name of the passenger. The railroads in the United States have generally given up the old brass checks and are now using heavy cardboard. The expense from loss of the brass checks and the difficulty of sorting them necessitated the change. In the instance of excess baggage the railway companies have developed a rather complicated system of handling large trunks, requiring the weighing of the baggage and the card listing of the weight as well as the rate at which it is forwarded.

Sec. 92. Mail

The railways of the United States received for the carriage of the mails in 1907, $50,378,964, which is less than two per cent of the total earnings of the railway companies. In European countries mail is carried gratuitously in considerable amounts, but in America, where the railroads are privately owned, no mail matter is carried without charge to the government. There are two forms of the mail service associated with the railways,—the pouch or closed mail service, and the compartment or railway post-office car service. The distinction between these two forms

of service turns upon the place where the mail is separated. In the first instance the mail is distributed in stationary post-offices along the route and is carried in closed pouches in the baggage cars. In the second type of service, which is growing rapidly and in time will almost entirely supplant the other, the mail is distributed after it reaches the cars. This has been the most marked feature of the handling of mail since the organization of the postal service of the railways, and it is said to have contributed more to the prompt delivery of mail than any of the improvements that have been made by the post-office departments. For these two types of service the government pays in two different ways. In the earlier days the mail carried in closed pouches in baggage cars was paid for entirely by weight, and for many years this form of payment continued until Congress allowed additional pay where postal cars were provided and extra service rendered in furnishing the facilities for distributing the mails in transit. The present plan of paying the railroads originated in the act of March 3, 1873, and since then the compensation has been reduced ten per cent by the act of July 10, 1876, and five per cent by the act of June 17, 1877, while land grant railroads were compelled to accept twenty per cent below that of other railways by the first act of July 12, 1876. Under the scheme of payment upon weight the rate per ton declines with the increase in the rate, as shown in the table below:

Rates based on weight of the mails.*

Average daily weight of mails over whole route—	Present pay per mile per annum.	Present rate per ton per mile.
200 pounds	42.75	1.171
500 "	64.12	.702
1,000 "	85.50	.468
1,500 "	106.87	.390
2,000 "	128.25	.351
3,500 "	149.62	.234
5,000 "	171.00	.187

On weights between 5,000 pounds and 48,000 the department makes a deduction of 5 per cent in the pay. When the weights are more than 48,000 pounds the pay amounts to $19.24 for each additional 2,000 pounds, with a reduced payment of $17.10 for each additional 2,000 pounds for land grant railroads transporting mail.*

The post-office department pays, in addition to the compensation based upon weight, an allowance for cars depending upon their size. For a 40-foot car the payment is $25 per annum per mile of track, and this increases until in the instance of the 55 and 60 foot car it is $40 per annum per mile of track. The railroads contend that, in the case of the car, it is necessary to make a round trip over each mile of road per day in order to earn the $25 per mile, and, therefore, they should have the old payment made under former acts. A great deal of contention has arisen in late years over the question of the payment of railway companies for the use of their cars, and much interesting information has been brought out regarding the practice in the United States, as well as in Europe. In European countries the government furnishes the cars and these are taken care of, with-

* Act March 2, 1907.
* Tunell, Railway Mail Service, p. 16.

out charge to the government, by the railway companies. The contention of the railroads in this country is that they are required to give mail trains right-of-way over all other trains and the strict provisions of the contract oftentimes place heavy burdens upon the railway companies.

Sec. 93. The Express Business

The business which is taken care of by the express companies in the United States is provided for in European countries by a number of business concerns or government activities. In America the express companies not only carry packages and freight, but they also handle money, letters of credit and other financial instruments. In Europe such money matters are in the hands of the post-office. The small packages are also carried by the same division of the government service.

During the World War period the principal express companies of the United States were combined for operation into one joint concern, known as the American Railway Express Company, and in 1920 this organization was continued under the terms of the new Transportation Act. The relation of the express companies to the railroads is a matter which has never been presented publicly in detail. Generally speaking the express companies are given a monopoly over a particular line of railway and agree to pay to the railway company forty per cent of their gross receipts in most instances, although this has been as high as sixty per cent. In return for the payments made to the railways, the express

companies are given quarters at the various stations, the use of the telegraph, and the transportation of their cars by fast trains. The rates charged are from three to four times the regular freight tariff, and where there is a value of more than $50 an additional charge is made.

The express companies have an organization somewhat similar to that of the railway companies, consisting of general superintendent, division superintendent, station agents, messengers, etc. The charges are made P. O. R. or C. O. D., and a waybill stating the facts of the shipment accompanies every package. The express companies have a very considerable community of interest. Thus, the president of one company is often a director on the boards of other companies, with the result that they are closely related, so that each company knows the purposes, plans, and policy of the others. The express business has developed into an enormous traffic, and the railroads, refraining as they do from transporting express freight on their own account, give the express companies an opportunity to use all their passenger trains, and in special instances where the express freight is so large as to delay the passenger traffic, special trains are run to meet the needs of the companies.

Sec. 94. The Pullman Service

With the exception of three or four railroads,—the Chicago, Milwaukee & St. Paul, the Great Northern, and the New York, New Haven & Hartford, the American companies have resorted to what is known as the Pullman service for their extra fare cars,

sleeping and dining cars. The extension of the Pullman Company's service over the railroads of the United States has been explained in the same way as the extension of the private car service. The supposition is that the Pullman Company can meet out of its large equipment of cars any demand of the railway companies that rely upon it for such service, and in consequence prevent any likelihood of failure on the part of the company to supply all the equipment that it might be compelled to use. With the extension of the mileage of the great systems, this argument has been considerably weakened, since the big systems would be compelled in any event to have a large number of cars in order that they might be transferred to those lines most needing them. For the use of their coaches the railroads pay the Pullman Company about one cent per mile of car movement; and in addition to this the Pullman Company receives the extra fares paid by the passengers for the use of parlor or sleeping cars. On some of the fast trains the railroads charge more than the regular first class fare to meet the cost of moving their trains at high speeds. The short mileage of many railroads in the earlier days made it possible for the Pullman Company to meet the demand for cars, but it can unquestionably be said today that if the Pullman Company were compelled to start anew many of the railway companies now using their service would undoubtedly operate their own cars, and it is a question how long it will be before the example of the Great Northern and other lines will be imitated in this respect by other roads.

Sec. 95. Heating and Lighting of Trains

In the old-fashioned cars the wood or coal stoves, fastened to the floor of the car by bolts and braces, were used to heat the interior of cars. Later on the Baker heater, with hot water coils, was introduced, and a very considerable step was taken in advance of the old stoves. But even the Baker heater has been given up for general use, and is seldom now resorted to except where cars are used for isolated work. In the place of the Baker system a number of steam heating schemes have been tried. The direct system of steam heating provides for the forcing of steam from the locomotive into the radiators, and there is also an indirect vacuum system, with two lines of pipes run into each car, one for supply and the other for exhaust. This plan is most generally in use. In some cases hot water from the engine is passed through the coils; in others the water is heated by the induction of steam from the locomotive into the water circulation. In some instances also the hot air system has been adopted.

The lighting problem has been a difficult one, but great progress has been made over the old-fashioned kerosene lamp in the electric lights of the present time. The Pinstch gas light has been, on the whole, a satisfactory light. It is made by gas produced by vaporizing an oil. Carbureted air has also been used, but the tendency to-day is toward the use of electricity. The storage battery coupled with the Biddle axle dynamo has been adopted by some lines with more or less satisfaction. When the car is in motion a current is produced by the dynamo connected with

the axle of the car, and it is stored for use in the battery. The difficulty with this system has been that the storage is not perfect, but when improved it will undoubtedly be a most desirable way of lighting trains, since it can be applied to any type of car. On the limited trains an electric unit has been set up in the baggage cars, and the dynamo in such cases is driven either by an engine or by a steam turbine. In case anything happens to the engine or the locomotive becomes hard pressed for steam, the electric lighting system breaks down. So much progress has been made in this direction, however, that it is only a question of time when trains will be perfectly lighted with practically no interruption in service.

Sec. 96. Fast Trains

It took a long time for railway companies to appreciate the fact that high speed trains met a social necessity and developed passenger traffic in a marked way, especially where the hours of the train schedule are convenient and careful attention is given to the comfort of passengers, though this last matter may be much more important than speed in increasing traffic. Unquestionably a fast train advertises a road and attracts what is called competitive travel. In 1880 there were ten trains per day between New York and Buffalo. These were operated over three different roads, and it required the fastest one fourteen hours to make the journey, at an average of 31 miles an hour. The slowest train moved at the rate of 21 miles an hour and required 21 hours to go from Buffalo to New York. In 1896 there were 25 passenger trains operated over five different roads

between the two cities, the fastest one moving at the rate of 53.3 miles per hour, and requiring 8¼ hours to go from Buffalo to New York. In 1880, fourteen trains operated between New York and Chicago, the fastest one moving at the rate of 27.1 miles per hour and the slowest at 25.1. In 1896 the number of trains had increased to twenty-four, operating over eight roads, the fastest one moving at the rate of 39.5 miles per hour and the slowest at 26.1 miles per hour. To-day the trip is made in eighteen hours, at a rate of more than fifty miles an hour. Similar improvements in service have been made between all the large cities.

The use of passenger trains by the public has materially increased, while the returns to the railroads have not been markedly greater. It is a question whether the increase in the use of passenger trains is a result of high speed or whether high speed is the result of the increased use. It is also a question as to whether speed is not chiefly important to suburban residents and long distance travellers. The increased speed of suburban trains means a very material enlargement of the residence districts. The railway companies have been compelled, in order to compete with the electric roads in the more densely settled districts, to materially better their suburban service. The fare probably has more effect upon patronage than the speed. In the matter of long distance travelling, two hours more or less on the way will not affect the journey in the minds of most individuals. It requires a full day anyway, and it is only in the instance of traffic between large cities, like New York and Boston, New York and Philadelphia, New

York and Chicago, that the matter of the speed becomes highly important. Without doubt many business men would be willing to take journeys if the round trip were reduced by an hour or more. It is said that the Empire Express has created a certain traffic of its own, because it enables business men to go from one city to another and return in the same day.

Beginning with 1895, and especially during the years 1898 and 1914, there has been a rapid expansion of interurban electric lines. These have been consolidated and reorganized into systems, so that today some of the states, more particularly Ohio, Michigan and Indiana, are covered with a network of trolley lines. The roadbeds have been improved, both as to grade and level, and a great deal of their track is private right-of-way, so that high speeds, with the new improved cars, are made possible. In the large cities the electric railway companies have built union stations, located in the shopping districts, an action making for unusual popularity. Speaking generally, the interurban lines have lowered the fares and cheapened travel. The fares are in many instances about one-half those of the steam roads, and the average passenger mile is in the neighborhood of 1½ cents. With the extension of the systems, book tickets under the commutation plan have been introduced with great success. In some of the cities merchants' associations have made arrangements by which they pay the fare of customers who purchase a certain amount of goods.

Just how much steam railway traffic has been affected by these lines, it is difficult to tell, but it

certainly is true that the short haul passenger traffic has been materially reduced. In the last few years the number of passengers on steam railroads has fallen off, and in states like Ohio travelling by steam between local points has been reduced to a minimum. As a usual thing the electric stations are more conveniently located, the fare is less and the trains more frequent. This, with the frequency of stops, gives a very satisfactory service that meets the needs of local travel.

The attitude of the railways toward this development has been varied. In some instances attempts have been made to cut the rates in order to retain the suburban traffic. In other instances the railroads have secured control of the competing electric lines and built others, or have actually electrified their own lines.

The trolley lines have had a marked effect upon the growth of truck farming and the development of suburban towns. The merchants have not lost by this change of conditions to any great degree, while the farmers have been materially benefitted, and property along the lines has been greatly advanced. It has at the same time made it easier to secure labor and introduced new factors of prosperity into the community.

Sec. 97. Terminals

While more elaborate and more expensive to build than the freight terminals, nevertheless the actual expense of ground and buildings is seldom as large in the case of passenger terminals as in that of the freight terminals. The passenger terminals re-

quire (1) baggage, express and mail rooms, (2) passenger car and equipment yards, (3) a passenger locomotive roundhouse, and (4) rooms for the sale of tickets and for the comfort and convenience of travelers. The baggage, express and mail rooms are an important adjunct of the passenger terminal station. These are in close proximity to the train shed and are provided with tracks and platforms for the easy handling of the baggage, express and mail. In the large stations separate provision is made for in-bound and for out-bound baggage business, and in some cases a division is made of hand and large baggage. The traveller does not come in contact with the express and mail rooms, and in view of the fact that the express is classified and handled at the city offices, there is little necessity for his doing so. The passenger car yards consist of a cleaning yard and a storage yard. In these days the cleaning yard is provided with various facilities for expediting the work of cleaning, and since the introduction of pneumatic cleaners the work has been very materially bettered as well as made less expensive. The engine house is in the neighborhood of the passenger station, and was in the past in circular form, but it has been found that the rectangular engine house is more commodious and much more satisfactory for the housing and cleaning of locomotives.

The great passenger stations of the world now provide the most advanced equipment and facilities for the handling of passengers. The new station at St. Louis, as well as the one at Washington, completed in 1906, are models in every way. The Boston Terminal Company's station has many unusual fea-

tures, and is as convenient and satisfactory for the movement of passengers, as well as the care of baggage, express and mail, as it could well be. The latest terminal station is that of the Pennsylvania Railway Company at New York City, and it is provided with the most elaborate facilities for the movement of trains and the care of passenger traffic that money and brains can secure. The trains move in and out of New York City by tunnels under the East River, and are drawn by huge electric locomotives especially built for the purpose.

CHAPTER VI

ACCOUNTING AND STATISTICS

Sec. 98. The Purpose of Statistics

From the simple system of the Russian peasant, who kept the moneys he paid out in one boot, and what he received in the other, turning the contents of each upon the floor at the end of the day for the purpose of balancing his day's business, to the elaborate systems of accounting now in vogue in the business offices of railway corporations, is a far cry. No precedent existed for them. Like Topsy, the systems of accounting have "growed up" with the railroads. Speaking broadly, two purposes actuate the keeping of accounts and the making of statistics. The one is to provide some knowledge regarding costs and receipts; the other to give information to managers as to the performance of trains and employes. "For managers' use facts must be exhibited with great particularity, as a working chart. Nothing bearing even most remotely upon net earnings is foreign to his field of interest. The problems involved in the management of a great railway system are of vast magnitude and complexity, and many railroad systems are so immense that they are not only railway companies, but financial institutions as well. The financial officers are as important as the traffic and operating men, and are as indispensable to its success. In the vast organization of the Pennsylvania

Railroad Company, for example, the first and fourth vice-presidents, as the heads of the departments of accounting and finance, are of as great assistance to the president, and as essential to the administration as the second and third vice-presidents, in charge of transportation and traffic. Indeed, many shrewd observers are of the opinion that the most eminent future chiefs of railroad systems will come from among the accountants rather than from among the engineers, the operating men, or the traffic people."*

Success in transportation depends more and more on the accumulation of small profits, and the conditions of business are now at such a point that net earnings are measured by a margin of one or two mills per ton mile. The result is that the study of receipts and payments is a very vital question, involving the coördination of all departments, maintenance, management and traffic, in their relation to the entire business. The statistical method of getting information is of first importance in the determination of the relation of net earnings to gross earnings. A cheaper method of doing business must be discovered in each department, but it must always be in the way of producing the greatest saving. This situation calls for talent. The arrangement of great masses of statistical material is the only means by which a clearer statement of the strength of a property can be secured. In fact, it is only through the use of such information that the bearing of prevailing methods and conditions and the probable effect of new ways of doing things is more likely to be seen when brought to bear upon the volume of net earn-

* The Railway Age, Vol. 29, p. 499.

ings. The railroads, therefore, have established elaborate systems of accounting and provided not only numerous clerks, properly organized and supervised by able men, but in addition expert statisticians whose particular business it is to exhibit in statement, table and chart the facts that come to them through the reports of the numerous departments of operation, accounting and auditing.

In the early days each department kept its own accounts. In order to secure any notion of what was going on over the entire road and in all departments, it was necessary to have a complete statement of the conditions in each department, and since the books were kept on a different basis, it was practically impossible to have a clear idea of the situation as a whole. The necessity of a central office soon manifested itself, and a separate accounting division in the work of administration was a matter of time only in the development of every railway. The interchange of business between railroads also forced uniformity of accounting and the development of clear statements and definitions of business transactions.

It is the business of the accounting division to keep a record of the business proceedings of the corporation, and to report the condition of the property and of receipts and expenditures at any given time. The books which are now kept by railroad companies consist in the main of a general ledger, a freight accounts ledger, a passenger accounts ledger, a material ledger, a record of vouchers audited, a record of bills audited, freight traffic, passenger traffic, and car service ledgers, station general ledgers, and miscellaneous accounts.

Sec. 99. The Purpose of Accounting

The demand for safe lending and comparatively easy borrowing has drawn a clear line of distinction in industrial finance which has had a marked effect on the purpose of accounting. The lenders of money are creditors, and stockholders are partners, so that both are entitled to know what is being done by the corporation as a going concern. It is no longer good financiering to sell evidence of indebtedness at heavy discount. From the point of view of the investor and the stockholder, it is the net earnings that are important. "The net earning power of a railroad depends upon two things: first, the character and volume of business offered to the company; second, its capacity for handling it economically. The first comprises all matters affecting rates, density of business, length of freight haul, or average distance travelled by each passenger, and other kindred matters. The second comprises all matters relating to operating expenses, such as the average train load of freight or passengers, the efficiency of motive power and rolling stock, the condition of track and structures, etc. When a clear idea is obtained of these things, it is evident that definite knowledge is secured of the earning power of the company. What we want to know, therefore, is everything that bears upon these things to any appreciable degree.

(1) We want to know the sources of the company's gross earnings; what proportion is passenger earnings, what freight, and what miscellaneous.

(2) It is very desirable that, in showing freight earnings, the amount in dollars and cents contributed

by each kind of freight, and the tonnage of each kind of freight, should be stated separately. The average rate per ton-mile should also be stated. Most railroads report the percentage of total tonnage borne by each kind of freight, but practically none give the statistics called for above. Presumably the statistics are available upon the books of all companies. Their chief value would be in showing basic changes in the character of the company's business, thus explaining important changes in the earnings and expenses.

(3) The average haul of each kind of freight should be separately shown. This would be extremely valuable as affording annual comparisons which would throw much light upon the conditions under which the company was operating. It could of course be calculated from the revenue per ton of each kind of freight by dividing it by the rate per ton per mile, but it would be well to state it separately.

(4) The company should state in each of its reports the passenger density and the freight density of the road for a series of years. Density is arrived at by dividing the passengers carried one mile by the mileage operated, and gives the best idea of the volume of business done by the road. Very few companies report it, although almost all report the factors necessary for its estimation. It would be well to report separately the density of the principal kinds of freight, so as to show where a road is gaining or losing business. At times this would be a most valuable showing, with a very direct bearing on net earnings and the cost of operation. Certain kinds of

business are more expensive to handle than other kinds; hence the variations in proportion between the various kinds of freight, and the density of each, are full of significance as bearing upon net earnings.

(5) It is desirable that reports should show the direction of a company's business. Most roads in this country run east and west or north and south, and some show the volume of business moving each way. This has a direct bearing on empty-car mileage. It is necessary that the character of the freight tonnage going each way should be shown, because the mere record of the tonnage is not sufficient. If the business one way is all cattle and the business the other way is all coal or grain, it is clear that, while the tonnage may be apparently equal, the empty-car mileage will be apparently unaccountably large, because cattle cannot be shipped in coal cars, nor can grain or coal be shipped in box cars. Hence the necessity for distinguishing.

(6) It is desirable to state local freight and through freight separately. Local freight may be taken as that which originates on, or is destined to, points on the company's own line.

(7) When the line does a very large passenger business, passenger statistics should be shown in the same detail as that prescribed for freight,—the object being to show plainly the company's main sources of business, the character and volume of that business, the revenue derived therefrom, and the circumstances under which it is obtained.

(8) It is very desirable that, where the business of a road is unevenly distributed over the year, being very heavy in certain seasons and very light at other

seasons, a clear statement of tonnage for each month should be made. This might throw a good deal of light on the efficiency or inefficiency of equipment when judged by the foreign car-mileage. A road which had a big rush of business for three or four months of the year might afford to pay considerable car-mileage rather than burden itself with equipment which would be useless for the remainder of the year."

The main thing the investor wants to know is what kind of a business the company is doing, and how it is likely to be affected by circumstances as they crop up. He wants to know whether the business is being economically handled and whether the property is being properly maintained; whether net earnings have really been earned after a proper charging up of expenses for all purposes, and the property kept at a full standard of efficiency. He wants to know whether operating expenses have been too heavily charged for transportation, and too lightly charged for maintenance.

"(1) The amount of money spent on each mile of roadway for maintenance of all kinds should be clearly shown in comparison with previous years, five at least, and ten if possible. It will be seen readily if there is a tendency to decrease or increase expenditures in this respect. The actual amount is of no great importance in itself, and must vary considerably on different roads, but a comparison with previous years is necessary as far as a given road is concerned.

(2) The amount of money spent for maintenance of equipment should be separately shown for locomo-

tives, passenger, freight and company cars, and the average expenditure on each should be shown in comparison with similar figures in previous years. In this way a tendency of expenses will show itself very plainly. Few railroads report expenses in this way, and many of them do not report materials for arriving at the required facts. It is commonly estimated that an expenditure for renewals and repairs of $1,000 per locomotive, $500 per passenger car, and $40 to $50 per freight car are about the level of average safety of standard roads. An investor must, however, be guided by the previous record of the road, especially taken in connection with capital expenditure for equipment. If this latter is heavy and expenses for maintenance are decreasing, the inference is that operating expenses are not being sufficiently charged. The converse is, of course, also true.

(3) Inasmuch as trains must be run, while maintenance may be postponed for a time, it is generally safe to reckon that little or no money is actually lost in direct expenses for conducting transportation. It is impossible to save money largely under this head, and at the same time run the same number of trains. It takes about the same number of pounds of coal, and pints of oil, and pounds of waste, and as many men and as much time, to run one thousand engine miles on one road as on another, at all events the variation will not be very large. Therefore, it is extremely important to know exactly how much is being earned by each engine-mile, or rather by each train-mile, for it is in the waste or saving of train-mileage that money is gained or lost. Our investor therefore will call for a statement of the number of

train-miles (freight or passenger), the number of tons of freight hauled in each freight train on an average, and the amount earned by each freight train per mile run; and similar information for each passenger train. Most companies report this information, but many do not. From it one can judge very closely of the relative efficiency of one's property. One road will show a constantly decreasing number of tons per train, while another will show an increase just as steady. The investor in the former property will have no difficulty in making up his mind that there is something wrong, and it will probably show itself in increased expenses for conducting transportation. If he looks deeper into the matter, he will probably find the trouble in the maintenance of way department, arising from failure to renew rails, ties or bridges, or in the maintenance of equipment department, in the shape of inefficient motive power, shortage of cars, through failure to make renewals, etc. This shows the importance of a clear statement of average expenses for maintaing each mile of roadway, each locomotive, and each car, over a series of years. Every train-mile saved means, on an average, at least thirty to forty cents in money.

(4) Another important thing is the mileage of foreign cars on the company's road, together with the mileage of the company's cars on foreign roads. Large mileage of foreign cars, not offset by large mileage of cars on foreign roads, frequently means shortage of equipment, and is one of those things that throws light on the condition of a property.

(5) The amount of tons carried, on an average, in each loaded car and the proportion of loaded cars

to empty ones are also of importance in determining the efficiency of a property. Many roads state them, but many do not. It is needless to explain the bearing of these items."

"By a comparison of items such as these above suggested, with those in former years, an investor or critic can form a very fair opinion as to whether or not operating expenses are sufficiently charged (they are practically never overcharged, as regards items of maintenance; certainly never from a conservative point of view), and whether or no the property is being efficiently operated. From this he can determine whether or not the company is actually earning what it claims to be earning. That is really the most important point to determine with regard to a railroad, and unfortunately it is just the thing that is not shown by most companies. Once an investor has satisfied himself of the integrity of net earnings, he knows exactly the position of his security, as "fixed charges" are not susceptible of change or manipulation at will. * * *

"The physical aspect of railroad accounting is therefore nowadays far more important than the more technical financial aspect, because it brings the investor closer to the actual causes, whose effects are shown in final results. No report is thus complete unless it shows:

(1) The character and composition (actual in tons and percentages of the whole) of the company's business, and the circumstances affecting each part thereof, including length of haul, density, revenue, and direction of business.

(2) The circumstances surrounding the handling

of this business, designed to show the efficiency of roadbed and equipment and sufficiency of expenditures for maintenance, as affecting the integrity of net earnings from operation."*

Sec. 100. The Nature of the Railway Report

A railway report should cover three things: (1) the earnings of the road, (2) its financial position, (3) its physical condition. There are in consequence three parts to a railway report, known as the Income Account, the Balance Sheet, and the Physical Statistics.

The Income Account. The income account also shows three phases of the railroad's affairs. These are income, expenses, and fixed charges. The income sets forth what has been received from freight, passenger, telegraph, express, mail, car mileage, switching, baggage, etc. The operating expenses consist of the charges made for maintenance of way and structure, maintenance of equipment, cost of conducting transportation, and the general expenses involved in the operating of a road. The fixed charges are the interest on funded debt, the interest on floating debt, rental, taxes, and sinking fund. When these are balanced against each other the statement appears in this form: Gross earnings, from which operating expenses are taken, leaving net earnings, to which is added other income. From the income is taken fixed and other charges necessitated by the meeting of bond and interest payments. The amount left is called the balance, and from this sum the divi-

* Woodlock, T. F., "The Physical Aspect in Railroad Accounting." Engineering Magazine, V. XII, p. 340.

dends are paid; and in the event anything is still left the road has a surplus. In some instances the term surplus has been used where balance is the term that should have been applied, leading to confusion regarding the actual position of the road. As an example of the income features of a railroad report, a brief statement may be made regarding the financial position of the Great Northern road. "A recent report shows the total income available for dividends to be $5,638,000, out of which dividends were paid in the sum of $3,851,000, leaving a surplus to profit and loss of $1,787,000. Details of expenditure, however, show that the sum of $1,800,000 was deducted from income before the payment of dividends, for outlay upon permannent improvements and renewals and for the construction of the Cascade Tunnel, etc. The previous year there had been a similar appropriation, ahead of dividends, from net income of $2,250,000. The details of operating expenses were not published, but evidence shows that the property has been fully maintained out of earnings, apart from these specific appropriations. The company's earning power, therefore, is not merely dividends, or dividends plus profit and loss, but the two combined with the amount of separate appropriations.

The equipment account is well managed. If equipment is destroyed or taken out of service, the cost of replacing is charged to operating expenses, and a special fund for the replacing of equipment is credited with the same amount. When equipment for replacement is bought the cost is charged to the account last mentioned. On the balance sheet the replacement fund appears among liabilities.

Steady progress toward efficiency is shown in the operating department. The average freight train load is 336 tons, and earnings per freight train mile are as large as $3.13."*

The second part of the report is the balance sheet, which is defined as a statement of the fixed property at its minor valuation and a distribution of the ownership. Theoretically the balance sheet is spoken of as the funded amount of the income account. "All the costs that have been consumed in the results of a single year's operation are brought together, with their results, in the general income account reduced to a net figure. This net figure is carried to the general balance sheet, being the amount of annual increment of fixed property or investment. For each dollar of investment representing earning power, there are registered in the income account the corresponding annual earnings." The balance sheet consists of a statement of assets and liabilities. The assets are divided into two groups of capital assets and current assets. The items in the capital assets are: (a) the total value of the property and franchise, (b) the investments, (c) the sinking funds, (d) the construction account, (e) other income. The current assets consist of: (a) cash, (b) loans and bills receivable, (c) accounts receivable, (d) amounts due from other companies, (e) amounts due from agents, (f) advances to other companies, (g) miscellaneous assets.

The liabilities of a railway corporation consist of capital liabilities and current liabilities. The capital liabilities are (a) stock, (b) bonds, (c) various forms

* Railway Age, Vol. 28, p. 854.

of certificate indebtedness. The current liabilities are (a) loans and bills payable, (b) accounts payable, (c) payrolls and vouchers payable, (d) interest and dividends accrued, (e) amounts due to other companies, (f) scattered liabilities.

Many questions arise as to the definition and the character of these various accounts, and in order to establish a clearer understanding of them Congress authorized a detailed accounting system, which has been placed under the administration of the Interstate Commerce Commission.

Legislation adopted June 29, 1906, requires the railroads to make special monthly and annual reports to the Commission and also to follow in their accounting systems a uniform method of accounts. Under the law these are divided into two general classes, operating accounts and capital accounts; the first having to do with the money received for services and the cost of rendering them, and the second handling the receipt from investments, payments upon capital, and other interests which relate to the corporation as a financial organization.

From the point of view of the Commission, there are two points upon which the correct determination of a sound system of accounting rests, namely, the net revenue from operation, with which all operating accounts are closed; and second, the accumulated surplus, which is determined in the presentation of the balance sheet.

The operating accounts cover six classifications: (1) the classification of operating expenses; (2) the classification of operating revenues; (3) the classifi-

cation of road and equipment expenditures; (4) the classification of locomotive miles, train miles, and car miles; (5) the classification of outside operations; (6) the classification of additions and betterments. The accounting scheme that has been developed by the Commission rests thus far upon four fundamental principles. First, the discount on securities is not an item properly included in the cost of property. Second, depreciation is an element of operating costs. Third, betterments and additions are not elements of such costs, but should be charged to capital account. Fourth, the total of assets and total of liabilities should be shown upon the balance sheet and the analysis of profit and loss should indicate the different kinds of liabilities covered by the accumulated surplus. With these principles in view the Commission has maintained that a correct statement of investments is the beginning of correct accounting, and it has therefore called for a careful presentation of the value of bonds, stocks and other securities of railway corporations.

The Commission proposes to take away from managing officers the power of deciding arbitrarily when a liability shall be taken into account. As time goes on these principles will be extended, and the hope is that the country may come to know, through the Interstate Commerce Commission, not only the value of railway properties, but the actual method of operating them, as shown in balance sheets and statistical statements. The law also provides for accounting officers and inspectors to enforce the provisions set forth in the act.

Sec. 101. Charges to Capital Account

One of the important problems in railway management is the charge to capital account. Under the method of charging to capital account, an item of expense often determines not only the question of the dividend at a given time, but the policy of the railroad regarding the payment of dividends in the future. This question as to what should be charged to capital account may be answered by asking, is it expense? is it operating expense? or is it construction? If the outlay is not currently consumed, but is intended to extend its effects over a considerable period of time, it is construction. Maintenance is the preservation of earning capacity, and the enlargements and betterments which take place from time to time are (a) those forced by competition, (b) the extension of lines to produce more service, (c) improvements made to reduce the cost of operation. The failure to make proper provision for renewals under the head of operating expenses means a gradual reduction in the earning capacity of the road. "In the history of all roads there is a period in the beginning when the expenses of rails, ties, rolling stock, etc., are extremely low, and the real deterioration is ignored or forgotten in the effort to keep operating expenses low until so-called extraordinary expenditures and betterments are required to put the road into good condition again."

A writer in the Railroad Gazette states than an examination of nine out of thirteen roads showed failure to make any adequate provision for renewals. Such a policy would lead in the end to bankruptcy.

The only remedy is to charge deterioration to renewals each year before figuring net earnings, and on new roads this would mean the setting aside of a definite replacement fund. It is a question whether construction or betterment accounts should not be entirely dropped, since they add in the long run to capitalization without increasing capitalization.

Sec. 102. The Analysis and Testing of the Report

From the point of view of the investor, a railroad report should show: (1) what the company earns, (2) what dividends it pays and what is the real margin of safety for those dividends, (3) how well the property is being kept up, not only in reference to its previous condition, but in connection with the demands made upon it by its business, (4) how well it is being managed as a going concern. These questions require an analysis of the report, and in order to secure such analysis several other questions must be answered and several comparisons made before the seeker for information can come to a fairly clear idea of the standing of the company.

In the first place the assets as set forth in the general balance sheet should be broken up into groups according to their negotiability, and the liabilities should be classified according to their maturity and pressure upon the corporation. The second question is a brief one,—Is the dividend earned? It can be determined in a general way whether the company has set aside the dividends without proper charges to operating expenses, maintenance of way, and upkeep of rolling stock, etc. Third, a comparison with past balance sheets will reveal a great

deal regarding the policy of officials in making the charges just referred to. Fourth, an examination should be made of the various accounts and the general condition of the road as a going concern. Fifth, the general commercial conditions upon which the traffic of the road really rests should be ascertained. Sixth, has legislation or the organization of traffic associations injured the business of the railway company? Seven, what is the personnel of the management? Has it been identified with speculative movements or has it been associated with the upbuilding of railroads as earning properties. Eighth, what has been the policy of the road in the maintenance of a surplus? On this last point an authority made the general statement that the strength of a corporation may be fairly tested by its reserve, which must vary with the character and form of the business. In the more stable industries, where the demand is regular, a smaller reserve meets all the requirements, and railroads are notable examples of stable demand. The best railroads have reserves amounting to about 15 per cent, and the possession of such a reserve gives a stability to the value of the stock and a strength to the credit of the road, which makes for high standing in the eyes of investors.

Sec. 103. Operating Expenses and the Ton Mile

In an interview several years ago, Mr. J. J. Hill made the statement that railroad income is based on ton miles and the expense of operation on train miles. Therefore, he said, the object is to get the highest rate on the ton mile and the smallest rate on the train mile. In this statement is concentrated

the theory of railroad management of the present day. The business of transportation has grown to such proportions that it is impossible for any one department, much less an individual, to have clearly before him the results of the operation of a railroad unless it is reduced to terms of some unit. It is said today that railroads are governed through statistics, and that the disciplining of the railway system is made possible through the application of units of operation and of performance. Managers of railway properties are compelled, therefore, to secure some basis from which it is possible to make comparisons, not only with the results of previous years, but with the performance of different divisions and different departments of the railway organization. In consequence a reduction is made in gross earnings and net earnings to the mile rate, a comparison of operating costs and gross earnings and percentages, a setting forth of net earnings as compared with fixed charges, of the revenue received from a train mile and the cost of moving a ton of freight the distance of a mile. When these percentages and units are obtained, the manager of the railroad has a series of statistical results that he can use for comparison purposes.

Defined briefly, transportation is the quantity of passengers and freight times the distance they are moved. In consequence, the passenger traffic equals the number of passengers times the number of miles they travel, which gives what are called passenger miles, and the freight traffic equals the number of tons times the number of miles billed, which gives the ton miles. In order to ascertain the density of

freight traffic, it is necessary to divide what is called ton miles by the mileage of the railroad, and to secure the passenger density it is necessary to divide the passenger miles by the number of miles of the railroad.

The basis of cost of operation is the train mile, as indicated above. In order to ascertain this, the total train mileage, either freight or passenger, is used as a divisor, the quotient being the cost of operation. Thus the phrase "cost of train mileage" is made a possibility. The revenue of the train mile is ascertained by dividing the total receipts from the operation of trains by the number of miles of train movement. "The great benefit of the tonnage system comes through the auditing department, whose calculations are based on the number of tons hauled. The total tons hauled one mile are treated as a divisor, the total expenses as the dividend, and the quotient is the cost per ton mile in transportation. The total number of loaded cars hauled one mile is treated in the same way, to ascertain the cost per train mile. Hence, it is possible to obtain the exact cost per train mile and ton mile in each thirty days for each department and each item, if desired. Likewise, an operating sheet can be made up for each division showing every account used by the auditor.

"A system of this sort gives each division superintendent an opportunity of knowing what his neighbor is doing, and a superintendent can be held responsible for the figures appearing upon the operating sheet, so far as transportation and maintenance are concerned; and, on the other hand, he is entitled to the results of his work as they appear in the tabu-

lation. Moreover, such a sheet makes it possible for the superintendent to see at a glance where he has been extravagant in the use of train miles, station service, or in fact, in any department or branch of his work, and the department is always in a position to know just what is being done without waiting a long time. It is, therefore, possible for the board of directors to know every month the actual cost of operation in train miles, car miles, and ton miles, and as a consequence to be able to ascertain the cost in practically every field of the railroad's management. On the other hand, the railway manager, by comparing the results of the operating sheet, is able to know practically what it costs to perform a given service, and he is in a position to know whether it is wise to develop certain kinds of traffic. It must be understood that the use of train movements cannot determine what business is profitable and what is not. It is in reality a measure of transportation efficiency. The variances in the determination of the ton mile make difficult and unreliable the comparison of different roads, as the conditions are seldom the same. The matters of speed, fuel, water, motive power, weather conditions, and the like, may materially influence the results of operation. For instance, it is not yet the uniform practice to include the weight of the engine and way cars under the tonnage of the train, but from the point of view of motive power it is important to credit engine and enginemen with all the work they accomplish, which of course includes the engine and caboose. If this is not done, there is no ton-mile credit for an engine running light or with a way car, and as the consump-

tion of coal under these circumstances is greater than under service conditions, the engine appears to have a bad record as a consequence, for it is not credited with the work that it has performed."*

The four classes of operating expenses as set forth by such an authority as Woodlock, in his "Anatomy of a Railroad Report," are: (1) the operation of traffic, (2) the expenses of general direction, (3) expenses of collecting and handling freight at terminals, (4) expenses of maintenance and operation of the plant not depending upon the movement of trains. Each of these divisions of expense may be tested by certain units of measurement. In the first instance operation is tested by the train mile, whether of freight or passenger. The second division of operating expenses is measured by the percentage to income. It should decrease with every increase of revenue. In the third division the measure is indicated by the general relation of the ton to the ton mile and the passenger mile. If the ton-mile revenue declines, the ton-mile cost ought to decline, and the expense of handling freight at terminals should decrease per ton with the increase in the amount that is handled. The fourth division,—expenses of maintenance and operation not dependent upon the movement of trains,—shows a rough correspondence between maintenance cost and cost of service, and can perhaps be presented on the mile-of-track basis better than on any other.

Summarizing these items, it would appear that one and four are placed upon a train-mileage and track-mileage basis, and two and three upon a pro-

* The Railway Age, Vol. 29, p. 155.

portionate revenue basis. The emphasis in Mr. Hill's statement was upon the ton mile and the train load. Mr. Woodlock emphasizes the train load as the supreme factor in determining the cost of the ton mile. The train load is governed by the character of the tonnage, the condition of motive power and permanent way and maintenance. Under the new system of disciplining a railroad the emphasis is always placed upon the tonnage carried in the train, not alone upon train mileage.

As summarized, the statements concerning units of cost may be put in some such form as this: (1) The ton mile is the unit of product and the measure of gross revenue in freight transportation. (2) The ton-mile revenue varies as the number of factors vary. (3) The principal factor in determining the ton-mile cost is the average revenue per freight ton load. (4) The train-load factor varies as the density of business. (5) It is absolutely impossible to determine exactly the ton-mile cost. (6) On roads where great density of traffic exists it is possible to approximate the ton-mile cost.

The costs which cannot be definitely laid upon some feature of transportation science are prorated. The purpose is to charge out every cent of cost if possible, but as indicated above, the cost varies not only with the service rendered but with the character of the product, so that numerous difficult problems arise in the endeavor to make a distribution. On railroads where the operations are being extended, the body of undistributable costs steadily increases. The line of distinction is often hard to draw, and in such cases the decision regarding the laying of the

charge is necessarily arbitrary. When this is done to any considerable degree the ton-mile cost and train-mile expense are suggestive and point to the need of adjustment. The train load in the movement of freight is a definite thing and it is possible through its use to ascertain whether train mileage is too great or not compared to the freight actually moved. Even in this instance the existence of numerous branch lines on which traffic is light may modify the conclusions. In no instance can the conditions of the traffic be overlooked when the statistical unit is applied. The public has come to place a great deal of faith in the units of transportation, and often use them without relation to the fact that there is little uniformity in the method of arriving at the result. Thus company tonnage is made a part of work done, resulting in a great cut in ton cost, while on the other hand not counting as a part of the earnings a profit appears, really larger than actually exists. Ton-mile cost cannot be used as a basis of rates. There may be a certain amount of uniformity in certain kinds of traffic, but the fact remains that no ton of freight is actually transported under average conditions. Moreover, the character, weight, and value of freight make it difficult to determine the rate per ton chargeable for transportation.

CHAPTER VII.

PUBLICITY

Sec. 104. The Meaning of Publicity

An old word has been used in a new sense to describe the act of making known the wares, business or services of a corporation or an individual. This term is publicity. In these days of investigation and research publicity has come to have a new meaning, and individuals and companies that hid their affairs under the cloak of intricate accounts or that refused to give forth any expression of their business affairs have found that the time when this was possible has passed, and every well administered corporation, especially a railroad corporation, appreciates the value of a public presentation of its affairs, in so far as they concern the general public. The efforts of railway companies to take the public into their confidence may be said to touch three particular phases of railroading. First, the nature and character of the traffic; second, the attitude of the public toward the railroad, as represented in newspapers and legislation, and third, the relation of the men employed by the railway company to itself. Relative to traffic, it may be said that the entire business of presenting railroad traffic matters to the public has undergone almost a complete change. The same is true in considerable measure of the attitude of the railroad to-

ward the public, and even toward the men whom it employs.

Sec. 105. Advertising

When the system of routing traffic under the old agency form of doing business was given over, railroads were compelled to resort to advertising, since individuals, either as passengers or shippers, determined the route that their business was to take. In the large cities the shipping clerk has given way to the railroad routing agent, who, by careful study of time-tables and railroad facilities, is often able to save money in freight and in time for the concern that he works for. An example of the usefulness of this officer is shown in the following incident: A western railroad received a consignment of freight for which three routes were open at $1.30, $1.36, and $2.17, per hundred pounds. The agent sent the shipment by the most expensive route. The traffic man has become an important factor in many business concerns, and by his bargaining with the railroads for rates often effects considerable savings. By specializing, this officer comes to have a wider knowledge of tariff rates than the railroad men, and consequently is able to discover many weaknesses and discriminations not recognized before.

The resort to advertising on the part of the railroads is limited in considerable degree to the passenger business. The methods used vary from the distribution of mailing cards, leaflets, pamphlets, and circulars, to newspaper advertising. The latter has materially changed. Instead of the miscellaneous hit-or-miss advertising formerly presented by rail-

way companies in the newspapers, there is now a careful write-up of a particular feature that the company wishes to bring to the attention of the public. The railroad through its connection with newspaper men is able to secure timely editorials and news items which call attention to the road's larger advertising. Leaflets attractively prepared set forth certain features, and pamphlets, often elaborate in character and wonderfully printed, are distributed with free hand to prospective travellers; but the use of the mailing card, setting forth the facts regarding certain trains, followed up by circulars at regular intervals, make the work of the passenger agent more effective. Most of the roads now place in the field travelling passenger agents to follow up any evidence of interest in their road through the medium of replies that have been turned over to them by district passenger agents. A great many of the railroads now use magazines, in page or half-page advertisements, to a larger degree than ever before. Sometimes these are accompanied by coupon advertisements, which if presented to the passenger agent call for some allowance on tickets purchased. In other instances lectures are resorted to for the purpose of arousing interest in the road and the territory through which it passes.

Sec. 106. The Industrial Commissioner

So closely akin is the work of the industrial commissioner to what has been described in the last section, under the head of advertising, that the matter may be well continued in connection with what is to be said on the subject of the industrial commissioner.

The particular business of this officer is to create new traffic, through the development of new territory, or to create new business in old territory. Railroads that have a great deal of land to sell, or which pass through land that has not been settled to any great degree, have organized immigration bureaus, usually in connection with the office of the industrial commissioner. An officer of one such road stated in reply to a question regarding the work of developing immigration and new territory which it was engaged in, "We have thirty-four men at work in the country east of Chicago advertising the Northwest. These men do not work in the cities, but confine their efforts entirely to the rural districts. They give lectures illustrated by stereopticon views in the country school houses and in the town halls of country villages. At every lecture quantities of literature concerning the Northwest, and particularly the state of Washington, are distributed among the audience. In addition to this, each one of the advertising agents carries with him Washington products, fruits, vegetables, etc., all of which are placed on exhibit. Besides this, the road carries on advertising work in the southern states, where it has a force of men who follow the circuses for advertising purposes. The circus collects the crowd and the railroad men take advantage of the opportunity offered to distribute information to a large number of people. Bundles of literature are slipped under the seats of the farmers' wagons. This literature is not thrown away, but it is taken home, usually before it is discovered, and unquestionably is read in most instances."

As a result of this systematic publicity work the

road expects at least 35,000 immigrants to go into the territory of the Northwest.

Other roads, like the Atchison, Topeka & Santa Fe, are carrying on systematic publicity work. Coaches are fitted up and stocked with farm products from all over the territory that is being exploited, and the car with its contents is exhibited not only along the line of the railroad, but in the larger cities and the country districts. The immigration agents of the Harriman lines were sent through the Northwest to learn at first hand of the needs and resources of the territory tributary to their roads, and at a meeting of the heads of the passenger, land and immigration departments of the Union Pacific it was decided some time ago to enter upon a more progressive campaign for the development of the Pacific Northwest, and for that purpose a corps of salaried workers with a liberal expense account was employed. A few years ago the railroads in the spring wheat states equipped trains for a campaign of education. These trains carried experts in the raising of wheat, and lectures were given with demonstrations at practically every village along their lines. In Iowa the corn trains made famous in that state carried the gospel of good seed to every part of the state.

Such in part is the work of the industrial commissioner. To be successful, it is necessary for him to have a thorough knowledge of the territory through which the road passes. This means not only the possession of information regarding resources, but the nature of the climate, the character of the population, the facilities for transportation, and

where markets can be found for products along the line. Manufacturers seeking a location for plants must be induced to invest their capital on the line of his road rather than somewhere else. In order to secure these results it is often necessary to carry on extensive correspondence with commercial clubs and town site agents. New traffic, if the road is to succeed, must be created, and this means the development of good will at every point. An industrial commissioner must be a man of great generalship, of ready tact and wit, and the possessor of an undying enthusiasm.

Sec. 107. Town Site Man

The title of this section does not always describe an official who is at the head of a department of a railroad. He may be a clerk in charge of town sites, or he may be an assistant to the land commissioner or the industrial commissioner. The location of town sites and their disposal are important considerations in the construction of new railroads, especially where they pass through sparsely settled territory. The location of a town is in many instances determined by the engineer, who places them at convenient intervals along the right-of-way. Occasionally some economic condition will force the placing of a town at a point where the engineer has not made provision for it in his survey. It is customary, however, to set aside a given territory for the town site, and in many instances these are sold to syndicates, who buy them at so much an acre and sell them out at so much per lot. While it is impossible for railroads to guarantee to any specific group the privileges of doing business

inside of a town which may be created, nevertheless, an early knowledge of the development of a town makes it possible for syndicates to organize banks, develop lumber yards, and secure a hold upon the necessary financial and industrial parts of the business machine.

Generally speaking, railroads have abandoned the old method of influencing legislation through lobbying. While many a reader may question this statement, the fact remains that the railroads are coming more and more to realize that the public is willing to be fair, if a fair statement of the situation, of the needs, and of the problem involved is presented to its representatives. The consequence is that today the railroads are employing publicity men who have a wide knowledge of the attitude of the public towards a railway and who understand the needs of the railways themselves. They use the newspapers freely and attempt to bring to bear on public opinion the facts involved in the railway controversy. One of the places in which the railway comes in contact with the public, especially the commonwealth governments, is in the field of taxation.

Sec. 108. The Taxation of Railways

There is at present no uniform system of taxing railway properties in the United States. It is stated that every possible form of taxation is in use somewhere in this country. In the development of transportation the country has acted as a group of communities varying widely in their industrial growth. In the history of the taxation of railways three stages may be noted. First, that of state aid and exemption

from taxation; second, the application of the general property tax in its simpler form; third, the gradual getting away from the general property tax and the adoption of systems of railway taxation.

As was shown in the earlier chapters of this book, the states were impressed in the first development of transportation with the wisdom of stimulating investments in railways. It was felt that the country needed means of communication, and that therefore every aid should be given, either in the form of subsidies or in exemption from taxation. As the roads grew stronger this policy fell into disfavor, and it may be said that at the close of the Civil War the subsidizing of railroads had practically ceased, except through land grants, though the exemption of them from taxation continued a much longer time.

It was natural that in the second stage the form of taxation most known to the people should be laid upon the railroads. In the earlier days we find that attempts to assess all the real and personal property of the roads were made by the local assessors. This was natural, since up to the middle of the century there were no great trunk lines and such railways as existed were purely local concerns. The lack of uniformity of assessments, the ease of evasion, and the inability to really get at the tax-paying power of the companies through this method brought it into increasing disfavor, though it must be said that centralization of assessment was attempted in a number of the states, with very great improvement over the old method of determining the valuation of the railroad.

The third stage was a further recognition of the necessity of regarding the railroad as an entity, dif-

ferent in character from other property, and one which should be taxed in a specific way. Moreover, it was recognized that an individual and a corporation, especially one engaged in the carrying of freight and passengers, were in no way similar, and that the tax law which applied to the first could not be successful when used as a means of securing revenue from the other.

The changes which have taken place in the old general property tax have been in the direction of placing the emphasis upon the incidence of the tax. This was seen in the tax against property capitalization and business receipts. The method in the first instance was to secure a schedule of all of the properties of the railway company in question, together with a statement of its franchise value. This was attempted in Michigan after an elaborate study of the properties of railway companies, and a plan was outlined by the tax commission of that state (previously described in Chapter 2, Part II.), by which it is possible to ascertain the value of the franchise as well. By combining the value of the physical properties and that of the franchise a taxable basis was secured upon which to levy the tax rate provided in the law of the state. In Wisconsin a similar method was followed, so far as the physical property of the railroad was concerned, while the franchise features were taxed through the medium of a license fee, meeting at the same time by this device the problem that arose in the taxation of property engaged in interstate commerce.

The commission system provides for a tax based on the market valuation of the capital stock and the

floating and funded indebtedness. Maine bases its tax on the capital stock. New York places a franchise tax based on the dividends paid by the capital stock. But taxation of this kind is exposed to considerable restriction because of the decision of the United States Supreme Court in 1873 to the effect that the taxation of that portion of the company's funded indebtedness which is held by non-residents is unconstitutional. The resort to the tax on business receipts seems to have met with greater favor. In some instances the rate is a graduated one, rising with the amount of the receipts. Probably the most successful form of the gross earnings tax is found in the state of Minnesota, where a percentage is placed upon all the gross earnings of the railway company that arise from the traffic inside of the state and an apportioned amount of the receipts from mileage of interstate traffic in the state to the total mileage. Sometimes a tax on net receipts has been urged as the most satisfactory and just method of taxing a railroad company, but in the cases where no net receipt actually exists the state would fail to receive a revenue. In addition to this it may be said that there is often very considerable difficulty in determining net receipts, the matter being easily interfered with by bookkeeping methods.

In the instance of express companies, sleeping-car companies, fast freight and car line companies, the taxation usually resorted to has been that of specific taxes upon the receipts of the company. In the instance of the express companies there is very little tangible property, though the franchises are often of great value. The tax on gross receipts gets

at the matter with thoroughness. In a good many instances, however, the sleeping-car and palace-car companies are taxed on the cash value of the rolling-stock. In other instances a percentage tax has been placed upon the annual receipts as well as one upon the capital stock of the company. Both systems have been applied to fast freight and car line companies, the tax falling either upon their receipts or upon their capital.

The taxes on railroads vary from $14.80 in the District of Columbia to $26.00 per mile in Indian Territory, a statement which confirms the greater diversity of assessment.

SUMMARY SHOWING TAXES AND ASSESSMENTS OF THE RAILWAYS IN THE UNITED STATES, BY STATES AND TERRITORIES, FOR THE YEAR ENDING JUNE 30.

State or Territory—	Amount.	Per mile of line.
Alabama	$ 983,658	$ 218
Arkansas	958,057	224
California	2,390,389	390
Colorado	1,390,514	287
Connecticut	1,360,234	1,339
Delaware	131,282	391
Florida	615,142	176
Georgia	1,068,654	166
Idaho	399,937	233
Illinois	5,649,300	472
Indiana	3,468,895	481
Iowa	2,300,545	234
Kansas	2,637,293	296
Kentucky	1,213,161	366
Louisiana	902,638	218
Maine	586,704	292
Maryland	861,931	620
Massachusetts	3,185,260	1,525
Michigan	3,408,883	398
Minnesota	3,407,313	429
Mississippi	783,265	214
Missouri	1,629,914	206
Montana	882,421	271
Nebraska	2,546,264	429
Nevada	409,646	265
New Hampshire	441,713	358
New Jersey	4,561,655	2,047
New York	5,764,330	686

North Carolina	704,533	177
North Dakota	1,031,593	265
Ohio	5,080,488	569
Oregon	391,737	228
Pennsylvania	5,541,396	510
Rhode Island	229,309	1,100
South Carolina	556,712	176
South Dakota	355,811	101
Tennessee	935,567	267
Texas	1,910,682	153
Utah	575,081	320
Vermont	177,040	172
Virginia	1,492,013	376
Washington	1,443,564	415
West Virginia	1,237,049	413
Wisconsin	3,009,273	414
Wyoming	211,122	141
Arizona	266,133	142
District of Columbia	46,345	1,480
Indian Territory	67,165	26
New Mexico	361,411	139
Oklahoma	544,984	194
Total	[1]$80,108,006	$ 367

[1] Excludes $204,369, as follows: $100,590, paid in the Dominion of Canada; $900, not localized by States and Territories; and $102,879, due chiefly to overestimates of taxes accrued, which were charged to income. Statistics of Railways in the United States, 1907, pp. 112-113.

The amount of taxes as shown in the foregoing summary for the year 1907 was $80,108,006, averaging $367 per mile of line, as against a corresponding amount of $74,602,171 for the year 1906, and an average of $349 per mile of line, showing an increase in total taxes over the preceding year of $5,505,835 and an increase of $18 per mile of line. It may be noted that the increase in taxation for the year 1906 over the year 1905 was $11,277,620 in the total amount and $46 in the average per mile of line.

In the next summary is found an analysis of taxes, by states and territories, showing the basis upon which they were assessed.

*ANALYSIS OF TAXES, BY STATES AND TERRITORIES, SHOWING THE BASIS OF PAYMENTS ACCORDING TO THE VARIOUS LAWS UNDER WHICH RAILWAYS ARE TAXED.

State or Territory.	Ad valorem tax. On the value of real and personal property	Ad valorem tax. On the value of stocks or bonds, or on valuation based on earnings, dividends or other results of operation	Specific tax. On stocks, bonds, loans, etc.	Specific tax. On gross or net earnings, revenue, or dividends	Specific tax. On traffic or some physical quality of property operated, or on privilege	Specific tax. On property owned, not used in operation, and miscellaneous	Specific tax. Unclassified
Alabama	$948,449	.....	.....	$16,796	$13,486	$4,927	.....
Arkansas	956,832	.....	$400	.....	.....	825	.....
California	2,221,081	$1,200	.....	.....	103	168,005	.....
Colorado	1,384,133	.....	360	.....	.....	6,021	.....
Connecticut	98,728	1,249,105	.....	.....	.....	12,401	.....
Delaware	40,089	500	503	.....	89,575	615	.....
Florida	612,441	.....	.....	.....	150	2,551	.....
Georgia	1,059,603	.....	175	3,909	2,001	2,591	$375
Idaho	398,872	.....	.....	.....	.....	1,065	.....
Illinois	4,368,934	.....	.....	1,222,472	.....	57,894	.....
Indiana	3,428,707	.....	.....	.....	.....	40,188	.....
Iowa	2,290,970	.....	.....	.....	.....	9,575	.....
Kansas	2,634,543	.....	.....	.....	223	2,527	.....
Kentucky	885,361	285,591	.....	.....	.....	36,628	5,581
Louisiana	888,793	.....	.....	.....	10,917	2,808	120
Maine	95,379	.....	.....	479,936	.....	11,118	271
Maryland	233,258	.....	.....	512,248	220	116,205	.....
Massachusetts	1,485,812	1,564,659	.....	11,800	79	122,910	.....
Michigan	3,358,190	.....	25,171	.....	.....	24,300	1,222
Minnesota	29,680	.....	.....	3,360,016	.....	17,617	.....
Mississippi	699,058	.....	.....	.....	83,687	520	.....
Missouri	1,623,859	.....	210	.....	.....	5,845	.....
Montana	877,145	.....	.....	2,600	.....	2,676	.....
Nebraska	2,543,372	415	.....	.....	.....	2,477	.....
Nevada	366,189	.....	.....	.....	.....	43,457	.....
New Hampshire	420,460	.....	.....	.....	.....	21,253	.....
New Jersey	3,799,700	681,761	100	.....	3,262	76,832	.....
New York	4,569,830	573,227	129,671	355,704	33,258	102,490	150
North Carolina	679,623	.....	.....	.....	17,528	5,006	2,376
North Dakota	1,029,853	.....	.....	.....	.....	1,740	.....
Ohio	3,501,290	20	2,095	1,410,450	.....	162,850	3,783
Oregon	383,321	.....	400	.....	610	7,406	.....
Pennsylvania	672,238	3,003,403	766,910	880,685	196	215,878	2,086
Rhode Island	228,167	.....	.....	.....	.....	1,142	.....
South Carolina	514,991	.....	.....	19,191	8,939	4,048	9,543
South Dakota	355,648	.....	.....	.....	.....	163	.....
Tennessee	923,705	.....	.....	.....	11,712	150	.....
Texas	1,542,214	351,056	10,615	3,756	60	2,646	335
Utah	571,159	.....	.....	.....	.....	3,922	.....
Vermont	4,105	.....	1,245	168,224	.....	2,610	856
Virginia	1,090,779	.....	950	399,005	.....	1,279	.....
Washington	1,269,215	.....	.....	.....	.....	174,349	.....
West Virginia	1,194,370	.....	10,215	.....	131	20,717	11,616
Wisconsin	2,828,826	.....	.....	146,434	1,040	32,921	52
Wyoming	211,122	.....	.....	.....	.....	.....	.....
Arizona	264,599	.....	.....	.....	.....	1,534	.....
District Columbia	34,680	.....	.....	.....	.....	11,665	.....
Indian Territory	61,224	.....	.....	.....	5,941	.....	.....
New Mexico	361,411	.....	.....	.....	.....	.....	.....
Oklahoma	544,218	.....	.....	.....	766	.....	.....
Total[1]	60,586,226	7,710,937	949,020	8,993,226	283,884	1,546,347	38,366

[1] See note 1, Statistics of Railways in the United States 1907, page 114.

Sec. 109. Relation to Men.

The railway companies have come to recognize their attitude toward the men they employ as one of the most important features of their relation to the public. The effort to secure better trained men has caused some of the companies to develop quite elaborate systems of education. This was discussed to some extent in the chapter on general administration. The attempt now is to develop a spirit of loyalty among the men, who should have a feeling of kindliness and good-will toward their employers. To this end railway companies have opened clubs, contributed to the Y. M. C. A., established lecture courses, and put on the road demonstration cars to help the men along in the knowledge of their work. This field, however, is too little occupied at the present time. The old type of men who began in the early history of the railway is rapidly passing away, and the younger men have more difficult problems to meet, where a larger technical knowledge is required. As time goes on the railroads will unquestionably come to develop very materially the educational side of their publicity work. This is likely to take the form of evening schools, correspondence courses, and instruction by travelling teachers and lecturers.

When the railroad company has developed its publicity work along the three lines indicated in this chapter it will have gone a long way toward the solving of the many difficulties and much of the friction that exists at the present time.

PART IV

THE RELATION OF RAILWAYS TO THE PUBLIC

CHAPTER I

THE RATE QUESTION

Sec. 110. The Railroad as a Business Organization

It is customary to look at the railroad from two points of view. The first of these might be called individual and the second social. The one represents the interest of owners, and the other the attitude of the public. From the point of view of the individual, the railroad is a corporation engaged in business for the purpose of paying dividends. Looked at as a social factor, it is a private corporation carrying on a public business, which so touches the communities of the country that the entire population is interested in its management. The further fact that the railroad is monopolistic in tendency, especially when organized into large groups by which competition is practically eliminated, creates a very interesting question as to the relation of the railroad to the public. We may look at the railroad first from the point of view of the owner, and second from that of the public.

Every transportation enterprise requires a large investment of capital. There are at first the primary expenses for the surveys, the bridges, the right-of-way, the buildings, the sidings, stations, viaducts, tunnels, and the erection of roundhouses and terminals, before any return comes to the investor. Unlike most business enterprises, a railroad once commenced

must not only be continued, but must be operated. If it is able to earn a profit, even though small, the chances of success are practically assured; but on the other hand if the management finds it difficult to earn dividends, the road must be run in order to meet the fixed charges, and when fixed charges cannot be paid, the operation of the road is continued in the hope of bettering the situation. Every railroad, whether bankrupt or successful, must have traffic. The expenses of a railroad are, in the main, independent of the amount of the traffic, and are, broadly speaking, divided, as we have seen, into two main classes, of fixed charges and operating expenses. The first are constant and invariable. The second are fluctuating and changeable. The relation of these two varies oftentimes, dependent upon many factors, but as a usual thing fixed charges amount to about 25% of the entire expenditures. Maintenance of way takes an additional 16%, and the remainder is the expense of operation.

A railroad is seldom operated to its full capacity as a carrying agent. The volume of traffic can be expanded almost indefinitely, so long as a fair profit is paid on the business; but when the capacity of a railroad and the equipment is reached, it is often questionable, in view of the low rates received, whether additional equipment should be added. This principle of the law of increasing returns may be offset by the low prices received for carrying the traffic because of competition or business conditions, it is possible therefore that a railroad may be actually damaged by the increase of its traffic.

From a business point of view, the company which

owns the road occupies a double position. It is the owner and at the same time the carrying agent. As the first, it is entitled to a return for use and maintenance, and as the second it is entitled to a payment for services which are rendered directly to shippers. As the owner of the road it must invest large capital in construction. The expense of maintenance is small in comparison with the amount required to pay interest at a normal rate on the capital.

"The absolute withdrawal of either the entire freight or passenger traffic would leave the claim of capital to its normal interest just as great as before, and it would effect but a trifling reduction of the cost of maintenance, and even in traffic working proper would produce very far from a corresponding reduction of expense. The withdrawal of certain categories of goods or passenger traffic, say export or market goods, or excursion passengers, would leave the volume of expense practically—the withdrawal of single consignments of goods or single passengers would leave them absolutely—unaltered. The expenditure—that is, of the railway company—is incurred almost wholly on the joint account of all of its customers. The accommodation it provides, and the service it renders, it must therefore render and provide at their joint cost."[1]

The interest of the shipper, on the other hand, is in the tariff. While he is willing that the railway shall earn in the aggregate a fair return upon the capital invested, the shipper insists that it shall be a reasonable return upon the capital the bases of whose valuation should be clearly understood. (See

[1] Acworth: "Theory of Railroad Rates." Econ. Jour., Vol. VII, p. 317.

Ch. 1, Part III.) These bases are put down as (1) original cost of construction, (2) the amount expended for permanent improvements, (3) the estimated expense of duplication, (4) the par or market values of stocks and bonds, (5) the actual value of the plant plus an estimated value of the franchise. Any one of these criteria taken by itself may be regarded as unsatisfactory. The capitalization, alone, is likely to contain inflated stocks. The cost of reproduction may not reflect the value that is given to good-will, or the increase in the efficiency of the roadbed through long use, and the value of connections that have stood the test of many difficulties. Nor is it certain that the property can be looked upon as being satisfactorily sold for what it will bring at the reorganization sale. The value of a railroad depends upon its earning capacity, and this in turn rests upon the rates.

It is only within certain limits that rates can be determined. Certainly no charge for transportation can be more than the actual value of the service, nor, on the other hand, can the charge for transportation service be less than the expense that has been incurred in rendering it. Between these two extremes is the actual rate which the shipper, on his side, can afford to pay, and, on the other, the point under which the road can not render the service.

Sec. 111. Theories of Rates

In general it may be said that the different points of view regarding rates may be put down under five different heads. (1) the cost of service theory, (2)

the postal service basis, (3) the value of the service to the shipper, (4) the taxation basis, (5) what the traffic will bear.

(1) The cost of service theory. This principle of rates has been urged by many writers, the idea being that railroads should charge what it costs to render the service. The items included in the cost have usually been extensive enough to cover the operation expenses of the road, the interest charges, and the various items necessary to carry on the administration. In its analysis, however, it is apparent that rates based upon cost of service could not be stable. It would be difficult to determine them far enough in advance to make it possible to say what the rates would actually be. The reason for this statement is that the conditions which enter into the operation of trains vary daily. A considerable part of the expenses of railroads cannot be apportioned to any one shipment. As one writer has put it, all costs are joint costs and the value to the consumer of the service cannot be measured by the cost of production. Railroad expenses vary inversely as the amount of business done. The volume of business necessarily changes, not only with the seasons, but with the industrial conditions existing in the territory through which the road passes. Consequently, a schedule of rates established upon this basis would change with every fluctuation of the economic conditions.

Besides these considerations, it must be apparent that the expenses of transportation rest upon the quantity, the quality and the value of the article, and the cost of service principle would undoubtedly impose the heaviest rates upon the cheapest and at the

same time the most necessary goods. An example of this statement is seen in the instance of coal, which throughout the entire history of transportation has been moved at a low rate. If the rate were based upon its cost, unquestionably it would be compelled to bear a larger burden, since railroads attempt to secure a margin of earnings by moving traffic which would not otherwise be moved at the ordinary rates. It still remains true, however, that the difficulty of ascertaining the cost of the specific service would make it almost impossible, even if the principle had other elements to commend it, to make it a workable plan.

(2) The postal service basis, sometimes called the equal mileage system of rates. This idea has been put forth as a result of a study of the postal system. "It takes two forms,—one in the demand for equal mileage rates over the entire country, and the other upon all parts of the same railroad. It is based upon the supposition that there is a relationship which is proportional in the cost of transportation to the distance through which a shipment is carried. In the field of practical railroad experience, it has been found that, generally speaking, it costs more to carry goods a shorter distance than a longer one. Moreover, the conditions of the road and the business vary greatly, so that the movement of freight over mountain roads would, without question, cost more than upon roads built over the plains. In 1900 the representatives of Nebraska at the Railroad Commissioners' Convention proposed to find the average cost of shipping a car of freight, and make on that basis a uniform rate. Thus, it is claimed that govern-

ment ownership and uniform rates, regardless of distance, would result in the Nebraska farmers' corn and hogs being carried across the continent on a postage stamp basis, while capital would be taxed to pay for it."[1]

This plan has received an impetus from the writings of Mr. Cowles, who has been an earnest advocate of a general freight and passenger post. The two principles underneath this plan are that railroad rates should be based solely upon the cost of the service, and that the postal principle, which disregards distance in fixing charges, should be extended to freight and passengers.

A modification of this idea is to be found in the zone system of rates, a plan adopted in Hungary and Austria. Under it all passengers pay the same amount for travel within the zone. The through traffic zones are larger than the local ones, and afford a low rate for those going some distance. The same principle has been extended to the movement of freight, the rate being based upon a unit distance of 10 kilometers (6.2 miles), and for the longer distances a proportional reduction is made. The object of the plan is to place commodities on the same basis though at the edge of zones the rate against a community would be greater than under the distance schedule.

(3) The value of the service to the shipper. It has been proposed that the shipper should pay the value of the service he receives from the railway company. Thus, if a bushel of wheat sells for 60 cents in a given place, and it will sell for 80 cents one thou-

[1] Railway Age, Vol. XXXIX, p. 557.

sand miles away, the value of the service appears to be 20 cents, and this from the point of view of the suggestion should be the rate for carrying the wheat the one thousand miles. But, it would not be possible to ascertain, with the thousand different kinds of freight, what the value is to the many consignees. When applied to the passenger service, it might not be especially difficult to secure a basis, but even here it never could be ascertained just what the actual value was.

(4) The taxation theory of railroad rates. This system is designated by the name given to it here because it bears some relation to a plan of taxation. Under this proposal, the shipper would pay a certain percentage of the value of the product which he is sending by the railroad, and as this would be in the nature of a definite fixed amount, determined perhaps by the government, it would bear some analogy to a tax rate based upon assessment of values. In brief, the reason for this suggestion is that a large item in the railroad's outgo, namely, the fixed charges, has no influence on rates. These cannot be changed, and the road must be run so long as it yields anything over operating expenses. While this is true, nevertheless, the object in operating a railroad is to pay dividends and make a profit on capital. If this same relationship could be determined between the cost of operation, including fixed charges, and the traffic moved, so far as its value is concerned, some percentage might be fixed upon that would not be burdensome to the shipper, and yet at the same time pay the dividends to the holders of stock and interest to the creditors. The difficulties it puts in

the way of competition and the improbability of securing a working basis interfere with the operation of this principle.

(5) What the traffic will bear. From the beginning the railroads in America have made their rates upon the principle of what the traffic could bear. The basis of this plan of rate-making has been worked out through practical experience. It was found that goods of different kinds paid different rates. The cost to the railroad might be the same, but the charges were unequal. From the railroad point of view, any business which paid a profit over the actual cost of performing it was worth while, since it was some contribution toward the payment of fixed charges. Ability to pay was really the test, but even here the charge must not be made larger than the service is worth or commerce is prevented. In fact, the tendency was to make the charge a little less, so that the phrase "charging what the traffic will bear" came to express a great business principle, justifying low rates on cheap goods and high rates on valuable ones. The application of this principle required classification of commodities; it resulted in local discriminations, and in more than one instance extended from these two into individual discrimination. The question arose in railroad circles, what freight can an article pay? The answer to this inquiry required a careful study of the conditions regarding the movement of freight. It meant a study of competition, of cost of production, of substitution of other articles, of the conditions of transportation. In fact, the official who had the matter in charge became an expert and the authority vested in him was

often used for the benefit of localities and individuals. "In railroading," says one writer, "the charge of what the traffic will bear is worked out much more carefully on staple commodities than on side issues, on carloads rather than on small shipments."

As said above, the principle of carrying freight on this basis is that of joint costs. If coal and dry goods were carried at the same rate, the coal could not be moved. Where a railroad is engaged in carrying a low grade ore, the cost of doing so must cover not only the movement of the loaded cars, but of the empty ones back to the point of destination. Any back loading of goods will be a clear profit, and if there is enough of this done, the company may be able to lower rates, certainly to pay something on fixed charges. Under the plan of charging what the traffic will bear, differential freight charges have arisen. These charges allow weak lines, with longest and most expensive hauls, to charge a little less than on the direct route, because of the greater delay and inconvenience. This principle of charging what the traffic will bear must approach a minimum point at which the traffic will not bear anything. When the cost of producing exceeds the market price there can be no movement of freight. And the same applies to transportation. "The railroad manager lowers the rates just so long as the increase of gross earnings is faster than operating expenses. The problem is complicated by the competition and the presence of receivership roads, the duties of common carriers under the law, and the right of eminent domain. And as each railroad is between two masters, the owners of the road on one hand, and the public on the other,

the problem of charging what the traffic will bear becomes exceedingly complex at times." An illustration of the development of traffic through the rate is indicated in an example cited regarding the Great Northern Railroad. Mr. James J. Hill said: "In 1896 my friends in the East did not want to shut down their steel mills. I said to them, 'Why not bid on Chinese and Japanese steel rail contracts? If you will bid low enough, I will make you a rate on the rails.' We carried 12,000 tons and lost money, but we had the fun of doing business. I made a rate of 40 cents per 1,000 to Yokohama. The next fall they sent 60,000 tons. Last fall (1898) we could have carried 80,000, but did not have the ships. In one week last November we refused 18,000 bales of cotton bound for Asia. We could carry it by land, but would have to drop it at the seaboard."

Sec. 112. Classification

Prior to the middle of the '80s each railroad had a classification of its own, though there were in addition various joint classifications with connecting lines. The passage of the Interstate Commerce Act forced greater uniformity, and there sprung into existence a series of freight classifications made by the railroads through joint committees. The official classification prevailing east of the Mississippi and north of the Ohio and Potomac is directed by a committee whose headquarters are in New York. The Southern classification is administered through a committee in Atlanta over the territory east of the Mississippi and south of the Ohio and Potomac. The Western clas-

sification prevails in the country west of the Mississippi, the headquarters of the committee being Chicago; while the classification for the Pacific Coast business is determined by the Transcontinental Freight Bureau at San Francisco. These classifications have come into existence because of the need of meeting the different questions which arise in connection with the rates chargeable against the different kinds of freight. While the general rule is to classify freights in proportion to the expense of carriage as compared with the ultimate price, nevertheless, cost of service, risk, and value are taken into consideration. Generally speaking, when the consumer's price is low, and transportation forms a considerable part of it, the charge made for the movement of the commodity is low. The condition of the commodity, whether in the original form or finished, liquid or dry, ready for use or in parts, whether boxed, crated or simply wrapped, with many other questions, are brought into the determination of the rate. The season, the manner of shipment, whether in carloads or less than carload, the volume through the year, the kind of car required, speed of trains,—all of these facts enter into the determination of the classification in which the article will be placed.

In addition to these features of classification, the railroads find it necessary to protect certain groups of shippers, and in order to do this discriminations are made in the rates charged against the movement of goods. Thus, if it is desired to protect a jobber as against a retailer, the rate is made much heavier on less than carload lots. When the classification is ex-

pressed in the terms of carrying charges, a tariff is created known as local and joint. The local tariff shows the rates between stations on the same road, and the joint tariff has to do with the rates existing between connecting lines. The classification is made by the committee. The tariffs are determined by the railroads. A commodity tariff is one which is based upon the bulky freight, such as wheat, coal, iron ore and the like. The class rates from which a large revenue is secured, have to do with the payments made upon classified freight, such as furniture, books, household goods, and the like. The density of the traffic has much to do with the rates charged. Thus, if the movement of freight is in one direction the rate may be comparatively high as compared with the rate charged for freight moving in the direction of the largest number of empty cars. In 1896 the Great Northern Railroad made the rate on steel rails from the mills to Japan referred to above for two purposes. One was to encourage the manufacture of rails during a depression period in the steel industry, and the other was to give the company traffic in the direction of its largest number of empty cars.

In the making of rates some distance is taken as the basis, as in the case of New York and Chicago, which in the official classification is accepted as 100 per cent. The rates for different cities round about may be figured from rates at these points, and when there is a change in the basic rate all the rates in the schedule are altered as a result. In the instance of the New York-Chicago basic rate the cities of Balti-

more and Philadelphia receive the advantage of the differential. From time to time disputes arise over the specific rates to large centers, and it is necessary to make new basing points, as is done in trans-Mississippi and trans-Missouri territory. Rate wars occasionally break out because of the demand for differentials. The Mississippi river is made a basing point between Chicago and St. Paul. This was due to the water competition by way of the lakes and Duluth. In the competition between the railroads and the water routes the railroads were compelled to make about the same rates as the water routes to points having such communication if they expected to carry any of the traffic. Any station midway between the point of shipment and the point of competition pays the rate determined by the competition of the water communication plus the local rate from the water points. In other words, the water point is made the basing point and the rates beyond it are made by combining the local rate from the basing point. One writer, in discussing this system of determining rates, says: "Although it has been severely criticised, this system of basing points could not have been developed solely for the benefit of the railroads. The railroads must serve the needs of commerce. No artifice of man can stem the working of economic law for any considerable time throughout so considerable a territory. * * * If the basing point be abolished, and a scale of rates fixed that uniformly increase with distance, the source of supplies will be driven back to the source of production. The retail dealer will no longer be able to keep as great a variety of merchandise on the same capital,

and as he will not be able to so promptly replenish his stock, it will no longer be so fresh."[1]

Occasionally a rate war is concluded by making a commercial city a single rate to all stations beyond a certain point. Thus, in the instance of Texas, the rate to that State from St. Louis is based on what is called the Texas common point territory. The result is that jobbing centers exist every forty or fifty miles and all of the distributing points are on a parity. The cities in the Mississippi and Ohio valleys can compete in Texas where rates are based on a fixed difference from St. Louis. The railroads are naturally opposed to a system of this kind, but it acts as a great protection to the distributing center of the state.

Sec. 113. Discrimination

Discrimination has come to have a double meaning in railroad management. In one instance it is the recognition of differences and the attempt to make charges for railway services that conform to these differences. The other phase is the granting of privileges to specific individuals as against general shippers. This last attitude is a harmful one, and it exists where a road exaggerates the actual differences in the traffic conditions or, on the other hand, fails to recognize them. Where unjust discrimination exists and unreasonable advantage is granted to particular persons, places, or types of traffic, and as a consequence subjects others to undue disadvantage, a rebate is a part of the scheme of discrimination. It is

[1] McPherson: "Railroad Freight Rates," p. 89.

a secret device by which a part of the payment made by a shipper is remitted to him. This may be done in various ways, such as repayment of a part of the charge, the performance of additional services, underbilling, excessive mileage, payments for private cars, allowance for terminal facilities, etc. It is generally conceded that roads may compete for new business, and grant low rates in order to secure it, but public opinion refuses to recognize the granting of privileges to individuals, places or different kinds of traffic, and consequently the feeling against discrimination is very strong. The St. Louis bridge charges are an example of discrimination in rates which may be looked at as fairly within the law. Investigations by the legislatures show four passenger rates,—a local rate, a bridge crossing rate, a terminal rate, and a through or foreign ticket rate. A uniform rate sufficient to pay a moderate interest on the cost of the bridge would have amounted to fifty cents. If this had been exacted, it would have cut off both local and suburban traffic, and in the end the bridge company and the passengers would have both lost; but by discrimination the bridge company was able to meet the local demands without interfering with the through traffic.

Discrimination between towns and villages is not justified unless there is some reason due to competitive conditions. A railroad ought not to put poorly situated communities on an equality with those that are well situated. On the other hand, it is not right for a railroad to make personal discrimination in favor of large shippers in order to secure their business nor to grant direct reductions and concessions for the

use of private cars and terminals. Such an action tends to build up large producers at the expense of the smaller ones, and results in the long run in a decrease of local transportation.

Sec. 114. Passenger Rates

There is a fundamental difference between the freight and passenger policy of a railroad. The decline in freight rates, generally speaking, has taken place at the same time with the increase in the freight traffic. In case of the passenger fares the situation is distinctly different. The original passenger fare was based on the old stage coach charges, and it had in mind the idea of a toll for the road and a charge for the kind of vehicle used. The maximum fares were a little below the charges on the old stage coach, and there was no great tendency to decline. It has only been within the last few years that the state legislatures have taken up the question of passenger rates and attempted by legislation to improve them. This movement began in Ohio in 1906. The Virginia legislature followed with the requirement that railroads should sell mileage books at the rate of two cents per mile. In 1907 Arkansas, Indiana, Illinois, Minnesota, Nebraska, Ohio, Pennsylvania and Wisconsin passed two cent fare laws. Some of the States made laws to apply to the main lines, with slightly higher figures for the subsidiary lines. These were Iowa, Michigan, Missouri, West Virginia and Virginia. A 2¼ cent rate in North Carolina and Georgia, and in Alabama, North Dakota and South Dakota a 2½ cent rate went into effect. The causes

of this movement were undoubtedly due to the widespread popular discontent with railroad conditions, coupled with the fear of giant railroad consolidations.

The Interstate Commerce Commission late in 1920 assumed partial jurisdiction over state rates as well as interstate, fixing passenger fares at 3.6 cents per mile.

Sec. 115. Equitable Rates

Just what is a reasonable rate has not been determined. The courts have said rates must be reasonable. In the movement from the legislatures where this question was first determined to the courts where it is now under consideration there has been an increasing tendency to place the determination of the rate upon the value of the service. In the Munn vs. Ill. case Chief Justice Waite said, "that what is reasonable is a judicial and not a legislative question." In the Peik vs. Chicago R. R. case the court said, "Where property has been clothed with a public interest, the legislature may fix a limit to that which shall in law be reasonable for its use. This limit binds the courts as well as the people. If it has been improperly fixed, the legislature, not the courts, must be appealed to for a change." In the case of Chicago, M. & St. P. R. R. vs. Minnesota, it was declared that the reasonableness of a rate is a judicial question, and if a company is deprived of the lawful use of its property without investigation by the judicial machinery, it is not given equal protection of the laws. In the Kansas City stock yard case (1901) it was held that the owner had a right to do business. "He has," in the words of the court, "a right to charge for each

separate service that which is reasonable compensation therefor, and the legislature may not deny him such reasonable compensation, and may not interfere simply because out of the multitude of his transactions the amount of his profits is large." Continuing, Justice Brewer, the writer of the opinion, says: "As to parties engaged in a public service, while the power to regulate has been sustained, negatively the Court has held that the legislature may not prescribe rates which if enforced would amount to a confiscation of property. But it has not held that the legislature may enforce rates that stop only this side of confiscation. * * * It has declared that the present value of the property is the basis by which the test of reasonableness is to be determined, although the actual cost is to be considered and that the value of the services rendered to each individual is also to be considered." * * * The authority of the legislature to interfere by a regulation of rates is not an authority to destroy the principles of these decisions, but simply to enforce them. * * * The question is always not, What does (the person performing a public service) make as the aggregate of his profits, but, What is the value of the services which he renders to the one seeking and receiving such services? Of course, it may sometimes be * * * that the amount of aggregate profits may be a factor in considering the question of the reasonableness of the charges, but it is only one factor, and is not that which finally determines the question of reasonableness." The courts now seem to be willing to permit a profit comparable with other industries, but in this view the reasonable-

ness of a rate falls back upon the value of the product and its relation to the cost of transportation. This is evidently the view of the Interstate Commerce Commission, which is attempting adjustment of freight charges and reasonableness of rates as applied to specific instances brought to the attention of the Commission.

The railroads have on the whole tried to determine rates on the basis of economic laws. In details errors have been made, but in the main under careful and wide investigation the principle involved in what the traffic will bear is the one that has produced the best results, nevertheless the amount earned on capitalization will continually bob up to disturb the view of reasonable pay for reasonable service. The basis of railroad rates from the legal point of view may be regarded as still unsettled and the rule applying to the ordinary business in the matter of profits will not be willingly and quietly accepted as applying to railroads when monopoly, unearned increment and increasing returns are taken into consideration. The lessons of the municipal plants and the attitude toward them would go to maintain this view.

CHAPTER II

STATE AND FEDERAL REGULATION

Sec. 116. The Meaning of the Term

The phrase at the head of this chapter is used to describe the attitude which the government takes toward the conduct of what is sometimes called a quasi-public business. It consists in the laying down of definite rules for the purpose of controlling the action of individuals and corporations in industrial matters. It differs from mere interference in the respect that interference is prohibitive rather than regulative. In a state where interference is the rule the government machinery is comparatively simple, but where the control is regulative the system is more complex, including inspectors, boards and commissions in its organization. Regulation presupposes a rule or order prescribed by a superior and competent authority which determines the actions of those under its control. "In any supervision of the railroad there are many inherent difficulties, involving the corporation, the shipper, the consumer and the state. To solve these by the dominance of the corporation is to give that organization too much power in the direction of industry; to regulate by competition of the shipper and consumer is to place the railroad at a disadvantage; the balancing of the factors requires the presence of a neutral agent, found, in some degree, in the state. The state can regulate by virtue

of its sovereignty; first, because it is the creator of the corporation and the giver of the right of eminent domain; and, second, for the reason that the shipper and consumer are citizens dependent upon it for protection against extortion, overcharge, and tyranny by its own creation, the railway corporation. Yet the problem involves the reconciliation of many conflicting agents, any one of which, unreconciled, means the disturbance at any time of at least a part of the industrial organization. There are, to briefly enumerate, the questions of railroad construction, of the organization of the corporation, of the securing of financial assistance and directors' responsibility, of the conflict of roads at competing points and terminals, the making of rates, the organization of shippers, discriminations, the conduct of allied industries by the carriers, and the great group of difficulties found in pooling and combination confronting the state in its attempts at regulation. Only in a measure can it be said that states have been successful in dealing with these manifold questions. Political considerations, national interests and sectional prejudice complicate the question of regulation of railroads."[1]

Sec. 117. Different Types of Regulation

It is possible to deal with the railroads in many different ways. First, the government might own and manage them, as illustrated in Europe and Australia. Second, the government might own the railroads and leave their operation to private companies, as is instanced in one or two cases in the United

[1] McVey: "Modern Industrialism," p. 242.

States and in some of the smaller European countries. Third, the railways might be owned by private companies and operated by the government. Fourth, there might be a mixed ownership and operation, with the idea of securing competition between the state railroads and the private companies, the purpose being to secure regulation of rates. Fifth, the railroads might be left to private ownership and management, as is seen in England and the United States.

Sec. 118. Regulation in England

The arguments in favor of the last point of view are usually put in this way: (1) greater efficiency in management; (2) greater adaptation to the varying demands of business or industrial conditions; (3) the avoiding of sectional disputes regarding rates which are likely to arise in the instance of government operation. From the very beginning of railway transportation in England the roads have been both privately built and privately owned. Because of the smallness of the country and the extended sea coast, water competition was always a possibility and personal discrimination seldom occurred. The questions which arose were largely those of relative rates between localities and maximum rates on different classes of goods. With the inception of the railway in England Parliament assumed to dictate regarding it, and as a result a body of law has been brought into existence which is the basis for the administration and regulation of the railways in the British Isles. All of the conditions of construction, the rates and

fares were subject to Parliamentary legislation, and public authority has dominated the English railway policy since the middle of the 19th century. As a result of this attitude a steadiness of rates was secured and the payment of dividends assured that was highly satisfactory to the shareholders both in their amount and regularity. All of this is in marked contrast to the pools, combinations and rate wars existent in the United States. The introduction of legislative control over railroads in England began through standing orders of Parliament. This method of supervision proved inadequate, and it was supplemented in 1842 by an act creating a government department, through which the Board of Trade was authorized to regulate, to bring action, and to generally supervise the relations of the railway companies to the public. The same act authorized the collection of statistics, and in the following ten years the supervisory powers were transferred to a body of railway commissioners and back again to the Board of Trade. Little or nothing resulted from this attempt at regulation, and the legislation enacted from time to time was finally given over to a commission organized in 1873 with judiciary powers. The findings of the Board regarding facts were final, but in matters of law their action was reviewable by a higher court. Fifteen years later the powers of the commission were increased, giving to the Board of Trade the right to suggest maximum rates. During the years 1891-1894 Parliament enacted the maximum rates, and in the latter year provided that no railway should increase existing rates within the maximum without proving to the railway commission

that the increase was desirable and justifiable. This provision of the law has been criticized on the ground that a manager would hesitate to establish a new rate if he found after experience with it he was unable to maintain it, since the law would prevent him from restoring it to its former place. The system in England so briefly described is one of moderate supervision by government commissions and boards within restrictions established by Parliament. It is regulation from the point of view of the shareholder, not of the shipper or of commerce; but it eliminates some of the worst features of control found in America, such as stock watering, rate discrimination, and jobbing of corporations.

Sec. 119. Regulation in the United States.

The Federal regulation of railroads in the United States virtually began with the enactment in 1887 of the Interstate Commerce Act, creating an Interstate Commerce Commission of five members to be appointed by the President with the advice and by the consent of the Senate. The Act applied to interstate and foreign freight and passenger traffic carried by railroads, or in the case of continuous shipment, by rail and water, but it did not apply to intrastate traffic, nor to interstate or foreign traffic carried entirely by water.

The Interstate Commerce Commission was vested with important powers with respect to the transportation systems of the nation. Among other things, the Act prohibited pooling, and all unjust personal discriminations in the form of special rates, rebates

or otherwise, forbade discriminations between localities, commodities and connecting lines, and required the provision of reasonable and equal facilities for the interchange of traffic. The Act also provided that all charges should be just and reasonable, and required rates and fares to be printed and posted for public inspection.

Although the provisions of the law appeared to be sufficiently comprehensive, it never accomplished the results anticipated by its framers, partly because, under the law, the orders of the Interstate Commerce Commission were not binding upon the railroads unless a Circuit Court of the United States compelled obedience, but chiefly because the courts so interpreted its main provisions as greatly to limit its scope. It was intended that the functions of the courts in connection with investigations by the Commission were to be confined to reviewing questions of law which might be involved in the enforcement of the Commission's orders. The courts, however, went much further than this and permitted the introduction of evidence which had not been submitted to the Commission. This practice naturally reduced the effectiveness of the Commission as an investigating body, inasmuch as it led to much duplication of effort, caused long delays in adjudication, and greatly increased the expense of litigation, thereby discouraging the submission of grievances to the Commission.

In spite of the failure of the law to accomplish the ends most desired, many beneficial results came from the legislation, among which may be men-

tioned publicity of rates, reduction of the number of freight classifications, and a better adjustment of charges, as between different shippers, different localities, and different commodities.

The next important step in the development of Government regulation of interstate commerce was the enactment of the Elkins Act of February 19, 1903, which made corporations as well as their agents liable for violation of laws relating to interstate commerce, and made deviation from the published schedules of rates the sole test of discrimination. The Expediting Act of 1903 gave all cases pending in any Circuit Court of the United States and brought under the Interstate Commerce Act, the Sherman Anti-trust Act of 1890, or any other acts having a like purpose, in which the United States Government was the complainant, precedence over all other cases.

In 1906 the Hepburn Amendment was enacted, which greatly increased the powers of the Interstate Commerce Commission, and extended the scope of the original act, making it applicable to express companies, sleeping-car companies and pipe lines for transporting oil or other commodities except water and gas, increasing considerably the things included in the terms "railroad" and "transportation." The law specifically invested the commission with rate-making powers which had been denied to it under the interpretations which the courts had placed on the provisions of the Act of 1887. The prestige of the Commission was also greatly increased by a provision to the effect that all its orders

except those for the payment of money should take effect within such reasonable time, not less than 30 days, as the Commission should prescribe. This law also conferred upon the Commission the power to prescribe a uniform system of accounts for railroads engaged in interstate commerce, and contained provisions further discouraging rebating.

The enactment of the Carmack Amendment of 1906 was of great advantage to shippers, since it required the carrier receiving traffic for interstate shipment to issue a bill of lading for such shipment, and made it liable to the lawful holder of the bill of lading for any loss or damage caused by any carrier over whose lines it might pass. The initial carrier was allowed to recover from the carrier on whose lines the damage occurred.

In 1910 the powers of the Commission were still further increased by the Mann-Elkins Amendment. Among other things, this Act vested the Commission with authority to suspend new rate schedules proposed by carriers until opportunity had been afforded the Commission to determine by investigation whether the proposed increases were justified.

The Panama Canal Act of August 24, 1912, prohibited any railroad company or other common carrier subject to the Act from owning, leasing, operating, controlling, or having any interest in common carriers by water or any vessel carrying freight or passengers operating through the Panama Canal or elsewhere in competition with such railroad or other carrier. This Act also vested in the Commission the authority to require the connection of rail and water

carriers where reasonably practicable; to establish through routes and maximum joint rates over rail and water lines; to establish maximum proportional railroad rates to and from ports; and to order any railway, entering into any arrangements with a carrier by water operating from any port in the United States for handling through business between an interior point therein and a foreign country, to enter into similar arrangements with any or all steamship lines operating from that port to the same foreign country.

There were two important measures affecting the railroads enacted on July 2, 1890, and on October 15, 1914, respectively. The former was the Sherman Anti-Trust Law which made contracts, combinations in the form of a trust or otherwise, or conspiracies in restraint of interstate or foreign trade or commerce illegal. Many illegal combinations were dissolved after the enactment of this law. The Clayton Act forbade all corporations engaged in interstate commerce to acquire stock of another such corporation where the competition might thereby be lessened, commerce restrained in any section, or a monopoly thereby created of any line of commerce. It was expressly provided that the law should not apply to corporations purchasing such stock for investment purposes solely, nor be construed as prohibiting a carrier, through the acquisition of stock, from aiding in the construction of short branch lines, nor prevent the extension of its lines through acquisition of such stock where no substantial competition existed between the purchasing and selling corporations.

The Interstate Commerce Commission was vested with authority to compel compliance with those sections of the Clayton Act applicable to common carriers.

Under the Act approved August 29, 1916, the President was empowered to take possession and assume control of any system or systems of transportation and to utilize them to the exclusion, as far as necessary, of all other traffic for the transportation of troops, war material, and equipment, and for needful and desirable purposes connected with the prosecution of the war. Acting under the authority vested in him by this Act, the President on December 26, 1917, issued a proclamation assuming control of all systems of transportation located wholly or in part within the boundaries of the continental United States, such control becoming effective on December 28, 1917.

World War Legislation.—On March 21, 1918, the Federal Control Act was signed by the President. This Act provided for the operation of the properties of the carriers during the war and for a reasonable time thereafter, not exceeding 21 months from the date of the President's proclamation of the exchange of ratifications of the treaty of peace, and for compensation for the use of their properties while under Federal Control.

This legislation was designed only to meet the emergency conditions arising from the war and it was specifically provided therein that it was not to be construed as expressing the future policy of the Government concerning the ownership, control or

regulation of the carriers or the method or basis of their capitalization. With the war ended, it became incumbent upon Congress to enact the necessary legislation to bring about the return of the railroads to their original owners and many plans were brought forward, designed to accomplish this result. Among these may be mentioned the plans offered by the railway executives; by the security owners; by the railway brotherhoods, which, under the name of the Plumb Plan, advocated purchase of the railroads by the Government and operation by the employees; by the National Transportation Conference, representing a composite of the ideas of the various interests involved; by the Senate Interstate Commerce Committee, known as the Cummins Bill; and by the Interstate Commerce Commission, known as the Esch Bill.

On December 24, 1919, the President issued a proclamation relinquishing control and operation of the railroads, such relinquishment to be effective at 12.01 a. m. March 1, 1920. The approach of the termination of the period of Federal control emphasized the necessity for immediate action by Congress. As a result, the Senate passed the Cummins Bill and the House passed the Esch Bill, each with numerous changes and amendments. The Conferees of the Senate and House, after considering the two bills made their report, which was approved by both Houses and became a law on February 28, 1920, upon being signed by the President.

Sec. 120-130. Summary of the Transportation Act, 1920.

Termination of Federal Control.—Under the provisions of the Act, Federal control* terminated at 12:01 a. m., March 1, 1920, at which time the President relinquished possession and control of all railroads and systems of transportation then under Federal control and discontinued Federal operation. Thereafter the President shall not have or exercise any of the powers conferred upon him by the Federal Control Act relating to—

(1) The use or operation of railroads or systems of transportation;

(2) The control or supervision of the carriers owning or operating them, or of their business or affairs;

(3) Their rates, fares, charges, classifications, regulations, or practices;

(4) The purchase, construction, or other acquisition of transportation facilities on the inland, canal, or coastwise waterways, or (except in pursuance of contracts entered into before the termination of Federal control) of terminals, motive power, cars, or equipment, on or in connection with any railroad or system of transportation;

(5) The utilization or operation of canals;

(6) The purchase of securities of carriers, except in pursuance of contracts entered into before the termination of Federal control, or as a neces-

*"Federal control" in this Act means the possession, use, control, and operation of railroads and systems of transportation taken over or assumed by the President under Section 1 of the Act of August 29, 1916, or under the Federal Control Act.

sary or proper incident to the adjustment, settlement, liquidation and winding up of matters arising out of Federal control; or

(7) The use of the revolving fund created by the Act of March 21, 1918, or any of the additions thereto, made under such Act or by the Act of June 30, 1919, for any of the purposes above stated, except in pursuance of contracts entered into before the termination of Federal control and for the settlement of matters arising out of it and except as provided in Section 202.

The power conferred upon the President, under the Act of August 29, 1916, with respect to taking possession, assuming control and utilizing any system of transportation in time of war, is not affected by this Act.

All transportation facilities on the inland, canal and coastwise waterways acquired by the United States under Section 6 of the Federal Control Act, except those constituting parts of railroads or transportation systems over which Federal control was assumed, are transferred to the Secretary of War, who shall operate or cause the same to be operated in accordance with the provisions of Section 201.

Settlement of Matters Arising Out of Federal Control.—As soon as practicable after the termination of Federal control the President is directed to wind up all matters arising out of and incident to Federal control. In addition to other funds which are made available for the purpose, the sum of $200,000,000 is appropriated.

The President is also given the right, at all reasonable times until the affairs of Federal control are concluded, to inspect the property and records of all systems of transportation which were under Federal control at any time, if such action is necessary (1) to protect the interests of the United States; (2) to supervise matters being handled for the United States by agents of the carriers; or, (3) to secure information concerning matters arising during Federal control. Carriers are required to provide all reasonable facilities therefor and, upon request of the President, to furnish all necessary and proper information and reports compiled from the records kept during the period of Federal control. They must also keep and continue such records and furnish like information and reports compiled therefrom.

Compensation of Carriers With Which No Contract Was Made.—Upon request of any carrier entitled to just compensation under the Federal Control Act, but with which no contract, fixing or waiving compensation, has been made and which has made no waiver of compensation, the President

(1) Shall pay it so much of the amount he may determine to be just compensation, as may be necessary to meet corporate charges and expenses referred to in paragraph (b) of Section 7 of the standard contract between the United States and the carriers, accruing during the period for which such carrier is entitled to just compensation under the Federal Control Act, and also the sums required for dividends; and

(2) May, in his discretion, pay it the whole or any part of the remainder of such estimated amount of just compensation.

The acceptance, however, of any of the above benefits by a carrier shall not deprive it of the right to claim additional compensation, which unless agreed upon shall be ascertained as provided in Section 3 of the Federal Control Act, but shall constitute an acceptance of all its provisions as modified by this Act, and shall obligate the carrier to pay to the United States, with interest at the rate of 6 per centum per annum from a date or dates fixed in proceedings under Section 3 of the Federal Control Act, the amount by which the sums received on account of such compensation under this section or otherwise exceed the sum found due in such proceedings (Section 203).

Reimbursement of Deficits During Federal Control.—As soon as practicable after March 1, 1920, the Interstate Commerce Commission shall ascertain for every carrier, as defined in Section 204, for every month of the period of Federal control during which its system of transportation was not under Federal operation, its deficit in railway operating income, if any, and its railway operating income, if any (called "Federal control return"), and the average of each, if any, for the three corresponding months of the test period* taken together (called "test period return"†).

*"Test period" means the three years ending June 30, 1917.

†"Test period return" in the case of a carrier which operated its railroad or system of transportation for at least one year during, but not for the whole of, the test period, means its railway operating income, or the deficit therein for the corresponding month during the test period, or the average thereof for the corresponding months during the test period taken together, during which the carrier operated its railroad or system of transportation.

For every month of the period of Federal control during which a carrier's system was not under Federal operation, the Commission shall ascertain:

(1) The difference between its Federal control return, if a deficit, and its test period return, if a smaller deficit, or

(2) The difference between its test period return, if an income, and its Federal control return, if a smaller income, or

(3) The sum of its Federal control return, if a deficit, plus its test period return, if an income.

The sum of such amounts shall be credited to the carrier.

For every such month the Commission shall ascertain:

(1) The difference between the carrier's Federal control return, if an income, and its test period return, if a smaller income, or

(2) The difference between its test period return, if a deficit, and its Federal control return, if a smaller deficit, or

(3) The sum of its Federal control return, if an income, plus its test period return, if a deficit.

The sum of such amounts shall be credited to the United States.

If the sum of the amounts credited to the carrier exceeds the sum of the amounts credited to the United States, the difference shall be payable to the carrier. In the case of a carrier which operated its system for less than a year during, or for none of, the test period, the above computation shall not be used, but the carrier shall receive its deficit in oper-

ating income for that portion (as a whole) of the period of Federal control during which it operated its own system.

Legal Proceedings Arising Out of Federal Control.—Legal proceedings, based on causes arising out of Federal control, which prior to Federal control could have been brought against the carrier, shall be brought against an agent designated by the President. Such proceedings may be instituted within periods of limitations prescribed by law but not later than two years after the passage of this Act, in any court which but for Federal control would have had jurisdiction of the cause of action had it arisen against the carrier. The procedure to be followed in serving process in connection with such proceedings is outlined in Section 206.

Claims for reparation on account of damage caused by the collection or enforcement by or through the President during the period of Federal control of rates, classifications, regulations or practices (including those applicable to interstate, foreign, or intrastate traffic), which were unjust, unreasonable, unjustly discriminatory or unduly or unreasonably prejudicial, or otherwise in violation of the Interstate Commerce Act, may be filed with the Commission within one year after the termination of Federal control against the agent designated by the President. The Commission is given jurisdiction to hear and decide such complaints, as provided in the Interstate Commerce Act. All such actions and reparation claims pending at the termination of Federal control shall not abate by rea-

son of such termination, but may be prosecuted to final judgment, substituting the agent designated by the President. Final judgments and awards shall be paid out of the revolving fund of $300,000,000 created by Section 210.

The period of Federal control shall not be computed as part of the periods of limitation in actions against carriers or in claims for reparation to the Commission for causes of action arising prior to Federal control. No execution or process other than on a judgment recovered by the United States against a carrier shall be levied upon the property of any carrier where the cause of action grew out of the possession, use, control or operation of any system of transportation by the President under Federal control.

Refunding of Carriers' Indebtedness to United States.—As soon as practicable after the termination of Federal control the President shall ascertain.

(1) The amount of each carrier's indebtedness to the United States at the termination of Federal control incurred for additions and betterments made during Federal control and properly chargeable to capital account, or otherwise incurred;

(2) The amount of indebtedness of the United States to the carrier arising out of Federal control, which amount may be set off against class (1) so far as the President may deem wise; but only to the extent permitted under any contract now or hereafter made between the carrier and the United States in respect to the matters of Federal control; or where no such contract exists, to the extent permitted un-

der paragraph (b) of Section 7 of the standard contract relative to deductions from compensation.

The right of set-off shall not be exercised so as to prevent the carrier from having (1) the sums required for corporate charges and expenses referred to in paragraph (b) of Section 7 of the standard contract, accruing during Federal control, and (2) the sums required for dividends declared and paid during Federal control, including also a sum equal to that proportion of such last dividend which the period between its payment and the termination of Federal control bears to the last regular dividend period. Nor shall such right of set-off be exercised unless there shall have first been paid such additional sums as may be necessary to provide the carrier with working capital in an amount not less than one twenty-fourth of its operating expenses for the calendar year 1919.

At the request of the carrier, any remaining indebtedness to the United States in respect to such additions and betterments shall be funded for a period of ten years from the termination of Federal control or for a shorter period at the option of the carrier, with interest at the rate of six per centum per annum, payable semi-annually, subject to the right of the carrier to pay on any interest-payment day, the whole or any part of such indebtedness. A carrier obtaining the funding of such indebtedness shall give such security as the President may prescribe.

If the President and any of the various carriers shall enter into an agreement for funding through

the medium of car trust certificates or otherwise, the indebtedness to the United States incurred for equipment ordered for the benefit of the carrier, such indebtedness so funded shall not be refundable under the above provisions. Any other indebtedness to the United States, which may exist after the settlement of accounts and which is then due, shall be evidenced by notes payable in one year from the termination of Federal control, or a shorter period, at the option of the carrier, with interest at the rate of six per centum per annum, and secured by such collateral security as the President may require.

The President shall have the right to make such arrangements for extension of the time of payment of any bonds, notes or other securities, acquired under the provisions of this Act (Section 207), or of the Federal Control Act, or of the Act of November 19, 1919, or for their exchange for other securities, or partly for cash and partly for securities as may be provided for in any agreement entered into by him or as may in his judgment seem desirable.

By agreement with the President, carriers may issue notes or other evidences of indebtedness secured by equipment trust agreements, for equipment purchased during Federal control by or through the President under Section 6 of the Federal Control Act, and allocated to such carriers respectively. The carrier may issue such evidences of indebtedness pursuant to this section without the authorization or approval of any state or Federal authority, and without compliance with any state or Federal requirement as to notification.

Rates.—All rates, and all classifications, regulations and practices, changing, affecting or determining any part of, or the aggregate of, rates, or the value of the service rendered, which on February 29, 1920, are in effect on the lines of carriers subject to the Interstate Commerce Act, shall continue in force until thereafter changed by Federal or state authority, or pursuant to authority of law. Prior to September 1, 1920, no such rate shall be reduced and no such classification, regulation or practice shall be changed so as to reduce any rate unless such reduction or change is approved by the Commission.

All divisions of joint rates in effect on February 29, 1920, between the lines of carriers subject to the Interstate Commerce Act, shall continue in force until thereafter changed by mutual agreement between the interested carriers or by state or Federal authorities.

Guaranty to Carriers After Termination of Federal Control.—Under Section 209 of the Act, the United States guarantees to carriers, as therein defined, operating income as follows:

(1) With respect to any carrier with which a contract (except a cooperative contract or waiver) fixing compensation has been made, that the railway operating income for the guaranty period, namely, the six months beginning March 1, 1920, as a whole, shall not be less than one-half the amount named as annual compensation, or where the contract fixed a lump sum for the whole period of Federal operation, that the railway operating income for the guaranty period as a whole shall not be less

than an amount which shall bear the same proportion to the lump sum so fixed as six months bears to the number of months during which the carrier was under Federal operation, including in both cases the increases in such compensation provided for in Section 4 of the Federal Control Act;

(2) With respect to any carrier entitled to just compensation under the Federal Control Act, with which such contract has not been made, that the railway operating income for the guaranty period as a whole shall not be less than one-half of the annual amount estimated by the President under the Federal Control Act, including the increases in such compensation provided for in Section 4 of that Act. If a carrier does not accept the President's estimate and tries its remedy in the Court of Claims, in which proceeding it is determined that a larger or smaller annual amount is due, the guaranty shall be increased or decreased accordingly;

(3) With respect to any carrier, whether or not entitled to just compensation under the Federal Control Act, with which such a contract has not been made, and as to which no estimate of just compensation is made by the President, and which in the test period sustained a deficit in railway operating income, the guaranty shall be the amount by which the deficit for the guaranty period as a whole exceeds one-half of its average annual deficit, plus an amount equal to one-half the annual sum fixed by the President under Section 4 of the Federal Control Act;

(4) With respect to any carrier not entitled to just compensation under the Federal Control Act, which for the test period as a whole had an average annual railway operating income, that the guaranty shall be not less than one-half of the average annual railway operating income of such carrier during the test period.

If for the guaranty period as a whole the railway operating income of any carrier entitled to a guaranty under (1), (2) or (4) above exceeds the minimum railway operating income guaranteed therein, or under (3) above exceeds one-half of the annual sum fixed by the President with respect to such carrier under Section 4 of the Federal Control Act, such carrier shall pay the amount of such excess into the Treasury of the United States. Any carrier, however, may retain out of any such excess an amount necessary to enable it to pay its fixed charges accruing during the guaranty period. The definition of "railway operating income" and the details of its determination are contained in Section 209.

The Commission shall, as soon as practicable after the expiration of the guaranty period, ascertain and certify to the Secretary of the Treasury the amount necessary to make good the guaranty to each carrier.

Upon application to the Commission, advances may be made to the carrier, during the guaranty period, not in excess of the estimated amount of the guaranty, to enable it to meet its fixed charges and operating expenses.

American Railway Express Company.—The contract of June 26, 1918, between the American Railway Express Company and the Director General of Railroads, as amended and continued by the agreement of November 21, 1918, in so far as it constitutes a guaranty on the part of the United States against a deficit in operating income, is to remain in full force and effect during the guaranty period, if the Company files with the Interstate Commerce Commission not later than March 15, 1920, a statement that it accepts all the provisions of subdivision (i) of Section 209 of the law.

For the guaranty period, the American Railway Express Company shall pay to every carrier accepting the provisions of Section 209 regarding the guaranty, 50.25 per cent of the gross revenue earned from all its express traffic on the carrier's lines, and the carrier shall accept from the former such percentage of the gross revenue as its compensation.

In arriving at the gross revenue on through or joint express traffic, the method of dividing the revenue between the carriers shall be that agreed upon between the carriers and the express company with the approval of the Commission.

If for the guaranty period the American Railway Express Company has no deficit in operating income, it shall pay the amount of its operating income for such period into the Treasury of the United States.

Upon application of the American Railway Express Company requesting during the guaranty period an advance of such sums, not exceeding the

estimated amount necessary to make good the guaranty, as are necessary to enable it to meet its operating expenses, the Commission may certify to the Secretary of the Treasury the amount of and times at which such advances shall be made. The Secretary is thereupon empowered to make such advances upon the execution by the Company of a contract with proper security, that upon final determination of the amount of the guaranty, the company will repay to the United States any amounts received from such advances in excess of the guaranty with interest at the rate of 6 per centum per annum from the time such excess was paid.

New Loans to Railways.—During the period of transition immediately following the termination of Federal control, any carrier may at any time after the passage of this Act and before the expiration of two years after the termination of Federal control apply to the Commission for a loan from the United States, stating (1) the amount of and purpose of the loan and the uses to which it will be applied, (2) the term for which desired, (3) the present and prospective ability of the applicant to repay the loan and meet the requirements of its obligations in that regard, (4) the character and value of the security offered, and (5) the extent to which the public convenience and necessity will be served. The application must be accompanied by the other data called for in Section 210.

If it is found that the making of the proposed loan or any part thereof by the United States is necessary to enable the applicant to properly meet the

transportation needs of the public and that the prospective earning power and the character and value of the security offered are sufficient to furnish reasonable assurance of the ability to repay the loan within the time fixed and to meet its other obligations in connection with the loan, the Commission may certify its findings of fact and its recommendations to the Secretary of the Treasury as to the amount of the loan which is to be made, the time, not exceeding five years from the making thereof, within which it is to be repaid, the character of the security offered, and the terms and conditions of the loan. The Secretary of the Treasury is authorized at any time before the expiration of 26 months after the termination of Federal control to make a loan not exceeding the maximum amount recommended in the certificate, out of any moneys in the revolving fund of $300,000,000 provided for by Section 210. Such loans shall bear interest at the rate of 6 per centum per annum and be placed to the credit of the revolving fund. The Secretary of the Treasury shall prescribe the time, not exceeding five years from the making thereof, within which such loan is to be repaid, the security which is to be taken therefor, the terms and conditions of the loan, and the form of the obligation to be entered into.

A carrier may issue evidences of indebtedness to the United States pursuant to the provisions of Section 210, without the authorization or approval of any state or Federal authority and without compliance with any state or Federal requirement as to notification.

Disputes Between Carriers and Their Employees and Subordinate Officials.—The law provides that it shall be the duty of all carriers, as defined in Section 300, and their officers, employees and agents to exert every reasonable effort and adopt every available means to avoid any interruption to the operation of any carrier growing out of any dispute between the carrier and the employees or subordinate officials thereof. All such disputes are to be considered and, if possible, decided in conference between representatives designated and authorized so to confer by the carriers or the employees or subordinate officials thereof directly interested in the dispute.

As a means of effecting settlement of such disputes, the law further provides that Railroad Boards of Labor Adjustment may be established by agreement between carriers and their employees or subordinate officials or organizations thereof. Each such Adjustment Board is to receive for hearing and decide disputes involving only grievances, rules, or working conditions, not decided in conference, as provided above, between the carrier and its employees or subordinate officials, who are, or any organization thereof which is, represented upon any such Adjustment Board.

Disputes may be brought before the Adjustment Board upon

(1) The application of the chief executive of any carrier or organization of employees or subordinate officials whose members are directly interested in the dispute,

(2) A written petition signed by at least one hundred unorganized employees or subordinate officials directly interested in the dispute,

(3) The Adjustment Board's own motion, or

(4) The request of the Labor Board, whenever such Board is of the opinion that the dispute is likely to substantially interrupt commerce.

United States Railroad Labor Board.—As a further means of settling disputes, a board is created to be known as the Railroad Labor Board, to be composed of nine members selected as follows:

(1) Three members representing employees and subordinate officials, to be appointed by the President with the consent of the Senate, from not less than six nominees offered by such employees;

(2) Three members representing the carriers, to be appointed by the President with the consent of the Senate, from not less than six nominees offered by the carriers; and

(3) Three members representing the public, to be appointed directly by the President with the consent of the Senate.

Any member of the Labor Board who, during his term of office, is an active member or in the employ of or holds any office in any organization of employees or subordinate officials or any carrier, or who owns any stocks or bonds thereof, or who is pecuniarily interested therein, is ineligible for membership upon the Board. No member, however, is required to relinquish honorary membership in, or his rights in any insurance or pension or other ben-

efit fund maintained by any organization of employees or subordinate officials or by a carrier.

The Labor Board is empowered to hear and decide disputes involving grievances, rules, or working conditions, upon certification to it by any Adjustment Board that in its opinion it has failed or will fail to reach a decision within a reasonable time, or in respect of which the Labor Board determines that any Adjustment Board has so failed or is not using due diligence in its consideration thereof.

Where an appropriate Adjustment Board is not organized the Labor Board shall receive for hearing and decide disputes involving grievances, rules, or working conditions which are not decided by conference between the carriers, their employees, or subordinate officials, and which such Adjustment Board would be required to receive for hearing and decision. It shall also receive for hearing and decide disputes with respect to wages or salaries not decided by conference between carriers, their employees or subordinate officials.

The Labor Board shall for these purposes act upon

(1) The application of the chief executive of any carrier or organization of employees or subordinate officials whose members are directly interested in the dispute,

(2) A written petition signed by not less than one hundred unorganized employees or subordinate officials directly interested in the dispute, or

(3) Its own motion, if it is of the opinion that the dispute is likely to substantially interrupt commerce.

The Labor Board may also, upon its own motion, within ten days after a decision has been reached suspend the operation of such decision if it is of the opinion that it involves such an increase in wages or salaries as will be likely to necessitate a substantial readjustment of the rates of any carrier, and it may affirm or modify such suspended decision.

Decisions of the Labor Board shall require the concurrence of at least five of the nine members, and in cases of decisions regarding wages or salaries, at least one of the representatives of the public must concur in the decision. Broad powers are vested in the Labor Board with respect to compelling the attendance of witnesses, production of books, documents, etc., and if it has reason to believe that any of its decisions or the decisions of an Adjustment Board are violated by a carrier or its employees, subordinate officials or any organization thereof, it may, after due notice and hearing to all persons directly interested in such violation, determine whether in its opinion such violation has occurred, and make public its decision in such manner as it may determine. No penalty is provided for the violation of a decision of the Labor Board.

Prior to September 1, 1920, each carrier is required, under penalty, to pay to each of its employees or subordinate officials wages or salaries at a rate not less than that fixed by any agency, or railway board of adjustment in connection therewith, established for executing the powers granted the President under the Federal Control Act, in effect upon the termination of Federal control.

Amendments to the Interstate Commerce Act.

The Transportation Act, 1920, makes many changes in the Interstate Commerce Act, the most important of which are outlined below. For the details of these changes, the reader is referred to Sections 400-502 of the law.

Rates.—The Commission is directed to establish rates which will be adequate to provide the carriers as a whole, either in the entire country or in rate groups or territories to be established by the Commission, with an aggregate annual net railway operating income equal as nearly as may be to a fair return upon the aggregate value of the railway property of such carriers held for and used in the service of transportation. The Commission is required, from time to time, to determine and publish the aggregate value of the property of the carriers and to determine what constitutes a fair return upon such property, except that for the two years beginning March 1, 1920, it is directed to take as such fair return a sum equal to 5½ per centum of such aggregate value. It may, in its discretion, however, add not more than one-half of one per centum of such aggregate value to make provision for improvements, betterments or equipment chargeable to capital account. For the purpose of determining the aggregate value of the carriers' property the Commission is directed to give to the property investment accounts, only that consideration to which they are entitled in establishing values for rate-making purposes.

If any carrier earns in any one year a net railway operating income in excess of 6 per centum of the value of the railway property held for and used by it in the service of transportation, one-half of such excess shall be placed in a reserve fund maintained by such carrier, until it equals 5 per centum of the value of the property, and the remainder paid to the Commission for the purpose of maintaining a general contingent fund. When a carrier's reserve fund equals 5 per centum of the value of its railway property, the portion of its excess income, which it is permitted to retain, may be used for any lawful purpose. The general contingent fund referred to above is to be used to make loans to carriers to meet expenditures for capital account and for other purposes described in the law.

Whenever the Commission finds that any rate, fare, charge, classification, regulation, or practice causes any undue or unreasonable advantage, preference, or prejudice as between persons or localities in intrastate commerce, or in interstate or foreign commerce, or any undue, unreasonable, or unjust discrimination against interstate or foreign commerce, it shall prescribe the rate, fare, or charge and the classification, regulation, or practice in such manner as in its judgment will remove such advantage, preference, prejudice, or discrimination.

The Commission is authorized to establish just, reasonable, and equitable divisions of joint rates where it finds that existing divisions are unjust, unreasonable, inequitable, or unduly preferential or prejudicial as between the carriers who are parties

thereto. While the Commission is empowered to prescribe maximum or minimum, or maximum and minimum rates, fares and charges, it is limited to prescribing maximum rates for through routes in cases where one of the carriers is a water line.

A further amendment to the Interstate Commerce Act provides that if any hearing with respect to rates, classifications, regulations, or practices can not be concluded within the period of suspension provided in Section 15 of the Interstate Commerce Act, as amended, the Commission may extend the time of suspension for a further period not exceeding thirty days, upon the expiration of which the proposed changes shall become effective as of the end of such period, provided the proceeding has not been concluded and an order made at the expiration of such thirty days. In the case of a proposed increase in freight rates the Commission may require that accurate account be kept of all amounts received by reason of such increase, and upon completion of the hearing, may require that such amounts as are found to be excessive shall be refunded to shippers.

Section 418 of the law contains other amendments to Section 15 of the Interstate Commerce Act pertaining to through routes of water carriers, transportation of live stock, etc.

Consolidations, Mergers, and Pooling.—Acquisition by one carrier of the control of another by lease or by purchase of stock or in any other manner not involving the consolidation of such carriers into a single system for ownership and operation, is

authorized upon approval by the Commission. Subject to the limitations set forth in Section 407 of the law, the Commission is directed to prepare and adopt a plan for the consolidation of the railway properties of the continental United States into a limited number of systems. Voluntary consolidations or mergers, which are in harmony with the plan as adopted, are permitted, subject to the approval of the Commission and to the requirement that the capital of the consolidated corporation shall not exceed the value of the consolidated properties as determined by the Commission. Division of traffic or earnings may be permitted by the Commission if, in its opinion, it will be in the interest of better service to the public, or economy in operation, and will not unduly restrain competition.

Joint Use of Terminals.—The Commission is empowered in its discretion to require the joint or common use of terminals, including main-line track or tracks for a reasonable distance outside of such terminals upon such terms as the carriers may agree upon, or, in the event of their disagreement, as it may find to be just and reasonable.

Construction and Abandonment of Lines of Railroads.—After ninety days from the effective date of the law, no carrier by railroad is permitted to undertake the extension of its lines or the construction of new lines, without having first obtained from the Commission a certificate that public convenience and necessity require such extension or construction. A certificate is likewise required before a carrier

shall acquire or operate any line of railroad or extension thereof, or engage in transportation over or by means of such additional or extended line, or abandon all or any portion of a line of railroad or the operation thereof. The authority of the Commission, as outlined above, does not extend to the construction or abandonment of spur, industrial, team, switching, or side tracks, located wholly within one state, or of street, suburban, or interurban electric railways, which are not operated as a part or parts of a general steam railroad system of transportation.

Security Issues.—The Commission is given power to regulate the issue of securities by railroad carriers. After 120 days from the effective date of the Transportation Act, 1920, no carrier is permitted to issue any stocks, bonds, or other securities or to assume any obligation or liability with respect to the securities of any other person, natural or artificial, without the approval of the Commission. This provision does not apply to notes maturing not more than two years after the date thereof, and aggregating (together with all other outstanding notes of a maturity of two years or less) not more than 5 per centum of the par value of the securities of the carrier then outstanding, or in the case of securities having no par value, the fair market value as of the date of issue.

Routing of Traffic. — Whenever property is diverted or delivered by one carrier to another carrier contrary to routing instructions in the bill of

lading, such carriers are made liable to the carrier thus deprived of its right to participate in the haul of the property, for the total amount of the rate or charge it would have received had it participated in the haul. This provision does not apply where the diversion or delivery was in compliance with a lawful order of the Commission; and in cases where the carrier to which the property was diverted had no notice by bill of lading, waybill, or otherwise, of the routing instructions, such carrier shall not be liable.

With respect to traffic not routed by the shipper, whenever the public interest and a fair distribution of the traffic so require, the Commission may direct the route which such traffic shall take after it arrives at terminus of one carrier or at a junction point with another carrier, and is to be delivered to another carrier.

Nondiscrimination. — The provisions of Section 404 of the Interstate Commerce Act, which prohibits discriminations on the part of common carriers, with respect to charges made for service rendered in the transportation of passengers or property, are made applicable to the transmission of intelligence. As a means of preventing unjust discrimination, all carriers by railroad, on or after July 1, 1920, are prohibited from relinquishing possession at destination of freight transported by them, until all rates and charges have been paid, except under such rules and regulations as the Commission may prescribe.

Long and Short Haul.—The long and short haul provisions of Section 4 of the Interstate Commerce Act are amended so as to provide that the Commis-

sion shall not permit the establishment of any charge to or from the more distant point that is not reasonably compensatory for the service performed. If a circuitous route is permitted to maintain higher rates to or from intermediate points on its line, in order to meet the charges of a more direct line to or from competitive points, such permission shall not include intermediate points as to which the haul of the circuitous route is not longer than that of the direct line or route between the competitive points.

Car Service.—An amendment to Section 1 of the Interstate Commerce Act places within the jurisdiction of the Commission the use, control, and supply, as well as the movement, distribution, exchange and interchange of locomotives, cars and other vehicles used in the transportation of property, including special types of equipment, as, for example, refrigerator cars, and the supply of trains. Carriers by rail are required, under penalty, to make just and reasonable distribution of cars for the transportation of coal among the coal mines served by them, and in time of car shortage are required to maintain and apply just and reasonable ratings of such mines and to count each car furnished to or used by any such mine for transportation of coal.

Increase of Membership of Commission. — The membership of the Commission is increased from nine to eleven members and their salaries are increased from $10,000 to $12,000 per annum. The salary of the secretary of the Commission is increased from $5,000 to $7,500 per annum.

Interlocking Directorates.—The effective date of Section 10 of the Clayton Anti-Trust Act, prohibiting common directors of carriers and of corporations from which they purchase supplies, is extended until January 1, 1921. This extension, however, does not apply to any corporation organized after January 12, 1918.

After December 31, 1921, all persons are prohibited from being officers or directors of more than one carrier without the consent of the Commission.

CHAPTER III

CONCLUSION

Sec. 131. Summary

The reader has reached with this chapter the last few pages of the book. In the material that has been placed before him an attempt has been made to cover in a general way some of the history, the problems and the legislation that has been a part of the development of the railroad in the United States. The impression that should be gained from the perusal of this array of facts is that the railroad is a great economic force, an organization well planned and equipped, doing an enormous work; rendering a service difficult to compute in dollars and cents, and confronted by problems of unusual difficulty in the fields of engineering, operation and regulation. The solution of these problems requires a spirit of tolerance, an attitude of fairness, and a willingness to look the facts in the face, and to base the decision upon a just interpretation of their meaning.

The development of the railroad in America has been markedly different from that in Europe. Here the frontier has been extended toward the west, new territory settled, and new towns built through the medium of the railroad. The turnpike and the canal, except in a few instances in the middle States, were preceded by the railroad, and after 1850 the canal

became a feeder to the railroad rather than a competitor. In Europe roadways were constructed and canals built long before the railroad came into existence, and the slow development of the railway in Europe was in a large degree due to the presence of admirable facilities of transportation that met the commercial requirements of the time fairly well. The vast resources in the Ohio and Mississippi valleys afforded a real economic basis for the rapid extension of the railroad, and the increase of production everywhere compelled expansion of the facilities by the railways as a means of transportation.

The history of the railway has been one of adjustment. In the earlier days the government did not count for much. Pioneers built roads, and the State was not asked for favors, until the internal improvement period of the '30s and '40s. The roads were at first short lines. These afterwards were brought together into a large organization and formed into a system later on. From the point of view of the track and right-of-way, an evolution has taken place quite as marked as in the development of traffic. From the wooden strips nailed to stringers to the T-rail in its present form is a great advance. The working out of locomotives with immense traction power from the mere toy engines of the earlier day required ingenuity, skill and science, and great shops to make this possible. The railroad passed from a mere local concern to a national one, from a group of roads with small mileage to a great consolidated system, extending over a large territory. From mere competitors in the same territory, the short lines have come to be integral parts of a great organ-

ization which controls the entire transportation facilities of a great district. The government helped this development through its land grant policy, and in later years when the roads had created a new empire, peopled it and made it an economic factor, they reaped their reward in the high prices of the lands that had been turned over to them as government subsidies.

This concentration of railroad organization was not accomplished in a single decade, but it required many years. The pooling question of 1870, following sharply upon the rate wars of the same period, was an attempt to solve some of the difficulties that arose from excessive competition. The failure on the part of the railways to recognize the place that they held in the economic organization made the question a national one, which found its way into the legislatures of the various States, and attempts were made to compel the railroads by law to do what the legislatures regarded as essential to the welfare of the commonwealths. Complications arose immediately through the conflicting legislation of the different States and the inability to secure uniformity of action. The matter, therefore, found its way into Congress, and out of this came the interstate commerce act. Hard upon the legislation of 1887 came the anti-trust act of 1890, which by the interpretation of the courts was made to apply to railroads as well as to combinations. These two acts, however, were important steps in the development of the history of railroad regulation by government. They marked a forward movement toward uniformity of legislation. Perhaps the highest point

in the history of government regulation was reached in the enactment of the Hepburn bill in 1906. This act when coupled with the interstate commerce act involved greater interests in scope and magnitude than did the earlier bill of 1887. While the Hepburn act was opposed by the railroads of the country, nevertheless the arousal of public opinion was so great that the bill was passed without any considerable difficulty.

Sec. 132. The Trend of Court Decisions

The trend of court decisions, up to 1900, had been practically toward the breakdown of the regulation under the interstate commerce act. The anti-trust act of 1890 was limited in its scope by a number of decisions, and the arousing of public opinion referred to above was largely due to the reaction that came from this restriction of legislative power. As already shown, the bill of 1906 extended the principle of detailed governmental supervision. The courts, however, through it all have maintained the right of judicial review, and subordinated the law-making branch to the law-interpreting branch. It has not yet been determined whether the legislature is to be subordinated to the court. While it is true that the courts have maintained the property rights of individuals, it should be always remembered that the larger public interests must be kept clearly before the government, whether legislative, judicial or executive. An English authority said:

"Regulation may be legislative, judicial, executive, or, as usually happens in practice, a combina-

tion of all three. But we may notice that, as Mr. Adams points out, in Anglo-Saxon countries it is the Legislature and the Judicature that are predominant; whereas in a country like France, which though a democracy is bureaucratically organized, it is executive regulation that is most important. Now, the capacity of the legislature to regulate is strictly limited; it can lay down general rules; it can, so to speak, provide a framework, but it cannot decide ad hoc how to fit into that framework the innumerable questions that come up for practical decision day by day.

"The capacity of the law courts to regulate is even more strictly limited. For not only is it confined within the precise limits of the jurisdiction expressly conferred upon it by the Legislature, but further, by the necessity of the case, a court of law can only decide the particular case brought before it; a hundred other cases, equally important in principle, and perhaps more important in practice, may never be brought before it at all. Even if the court had decided all the principles, it has no machinery to secure their application to any other case than the one particular case on which judgment was given. There was a case decided thirty years ago by our Railroad Commission, the principle of which, had it been generally applied throughout the country, would have revolutionized the whole carrying business of Great Britain. It has not been so applied, to the great advantage, in my judgment, of English trade. Further, the great bulk of the cases which make up the practical work of a railroad: 'What is a reasonable rate, having regard to all the circum-

stances, present and prospective, of the case? Would it be reasonable to run a new train or to take off an old one? Would it be reasonable to open a new station, to extend the area of free cartage, and the like?' —all these are questions of discretion, of commercial instinct. They can only be answered with a 'Probably on the whole,' not with a categorical 'Yes' or 'No,' and they are absolutely unsuitable for determination by the positive methods of the law court with its precisely defined issues, its sworn evidence, and its rigorous exclusion of what, while the lawyer described it as irrelevant, is often precisely the class of consideration which would determine one way or other the decision of the practical man of business.

"It seems to me, therefore, that both in England and in America we must expect to see in the near future a considerable development of executive government control over railroads.

Sec. 133. Probable Executive Control

"This is not the place to discuss in detail the form that control should take, but one or two general observations seem worth making. The leading example of executive control is France; in that country the system is worked out with all the French neatness and all the French logic. But it is impossible to imagine the French principle being transplanted here. For one thing, the whole French railroad finance rests upon the guarantee of the government. The French government pays, or at least is liable to pay, the piper, and has, therefore, the right to call the tune. The English government has not paid, and

does not propose to pay, and its claim to call the tune is therefore much less. Morally the French government has a right—so far at least as the railroad shareholders are concerned—to call on a French company to carry workmen at a loss; morally, in my judgment at least, the English government has no such right. But there is a further objection to the French system: the officers of the French companies have on their own responsibility to form their own decisions, and then the officers of the French government have, also on their own responsibility, to decide whether the decision of the company's officer shall be allowed to take effect or not. The company's officer has the most knowledge and the most interest in deciding rightly, but the government official has the supreme power. The system has worked, largely, I think, because the principal officers of the companies have been trained as government servants in one or other of the great Engineering Corps, des Mines or des Ponts et Chaussées. But it is vicious in principle, and in any case would not bear transplanting.

"What we need is a system under which the responsibility rests, as at present, with a single man (let us call him the general manager), and he does what he on the whole decides to be best, subject, however, to this: that if he does what no reasonable man could do, or refuses to do what any reasonable man would do, there shall be a power behind to restrain, or, as the case may be, to compel him. And that power may, I think, safely be simply the Minister—let us call him the President of the Board of Trade. For, be it observed, the question for him is

not the exceedingly difficult and complicated question, 'What is best to be done?' but the quite simple question, 'Is the decision come to, which I am asked to reverse, so obviously wrong that no reasonable man could honestly make it?'

Sec. 134. Advisory Bodies

"And even this comparatively simple question the President would not be expected to decide unaided. He will need competent advisory bodies. Railroad history shows two such bodies that have been eminently successful,—the Prussian State Railway Councils and the Massachusetts Railroad Commission. Wholly unlike in most respects, they are yet alike in this: their proceedings are public, their conclusions are published, and those conclusions have no mandatory force whatever. And it is to these causes that, in my judgment, their success, which is undeniable, is mainly due. Let me describe both bodies a little more at length.

"There are in Prussia a number (about ten I think) of District Railway Councils, and there is also one National Council; they consist of a certain number of representative traders, manufacturers, agriculturists, and the like, together with a certain number of government nominees; and the railroad officials concerned take part in their proceedings, but without votes. The Councils meet three or four times a year, their agenda paper is prepared and circulated in advance, and all proposed changes of general interest, whether in rates or in service, are brought before them, from the railroad side or the

public side, as the case may be. The decision of the Council is then available for information of the Minister and his subordinates, but, as has been said, it binds nobody.

"The Massachusetts Railroad Commission is a body of three persons, usually one lawyer, one engineer, and one man of business, appointed for a term of years by the governor of the State. Originally the powers of this commission were confined to the expression of opinion. If a trade, or a locality, or indeed a single individual, thought he was being treated badly by a Massachusetts railroad, he could complain to the commission; his complaint was heard in public; the answer of the railroad company was made there and then; and thereupon the commissioners expressed their reasoned opinion. The system has existed now for more than thirty years, and it is safe to say that, with negligible exceptions, if the commission expresses the opinion that the railroad is in the right, the applicant accepts it; if the commission says that the applicant has a real grievance, the railroad promptly redresses it on the lines which the commissioner's opinion has indicated. The success of the commission in gaining the confidence of both sides has been so great that of late years its powers have been extended, and it has been given, for example, authority to control the issue of new capital and the construction of new lines. But on the question with which we are especially concerned here, the conduct of existing railroad companies as public servants, it can still do nothing but express an opinion; and it may be added that the commission

itself has more than once objected to any extension of that power."*

[Note.—England now has a Minister of Railways.]

Sec. 135. Efforts Toward Betterment

Reference has already been made to the potential power of public opinion, and what it secured in the United States at the time of the passage of the Hepburn act of 1906. It is certain that no considerable regulation of the railway can be possible unless there is a very clear understanding on the part of the public as to what is desired and what should be done relatively to the regulation of railway companies in the carrying of traffic. Some progress in this direction has already been made. The investor has a greater safety in the holding of railway bonds, and even in the purchase of stock, than he ever has had before. This is due in a measure to a number of things. In the first place, the railway corporations have steadily moved toward more thorough equipment, better track facilities, and a closer adherence to the principle of making proper charges to capital account. In the second place, the shipper now receives a consideration which in the days of the Granger legislation was entirely denied him. Personal discrimination has, in the main, disappeared, and while there is occasional place discrimination, yet the railways are asking for rates based upon a more reasonable interpretation of service than has ever been the case before. From the point of view of the public, the railways are attempting to meet their demands as

* Acworth, W. M., The Relation of the Railroads to the State, Address before the British Association.

quickly as possible, and in a spirit of greater kindliness and more accommodation. Turning to the matter of employees, we find that the railways have adopted better facilities for the comfort of employees, and are taking more care of them in every way, protecting them from the severity of the weather and the difficulties of the service, and trying to give them a larger interest and more opportunities to grow in the service of the company. The existence of tax commissions in some of the States, together with attempts under public direction to value the railway properties, have given to the public a clearer conception of the amounts of money invested in railway enterprises and the cost of operating the great systems. Railway managers have also attempted to discipline their organizations through the use of statistical knowledge, and where this has been done it has been possible to secure a more comprehensive idea of the actual performances of operation, of the difficulties associated with it, and the real needs both of the railways and the public.

Looked at in these earlier days of the twentieth century, railways are putting forth every effort to better their properties. Larger locomotives are being used, better equipment, the heaviest of rails, the strongest of bridges, and in fact everything that science and mechanical ingenuity can devise are now being utilized by the railway companies for the betterment of their service. The limit, however, of locomotive size, of car equipment, and of speed of train has been practically reached, and while the population increases at a comparatively slow rate, nevertheless, the transportation needs and demands of the

country grow at an appalling rate. The future, therefore, would seem to call for extended increase of railway facilities which cannot be met simply by the increase in the size of locomotives and cars, but which must be met by further construction, more railroads, larger terminals, and a marked development of railroad property. From the point of view of the State the problem will become increasingly great, and the matter of regulation which has just been entered upon with some degree of earnestness will never grow smaller, but rather will become more and more complicated with the passage of the years. Adherence to sound principles, listening to the evidence of facts, and a clear appreciation of the problems. Just how far have we gone in this direction in the United States is difficult to say. The Interstate Commerce Commission has always been confronted by lack of facts and the reluctance of the railroads to supply them. This difficulty has been met in the main by the requirements of the law relating to reports and publicity of accounts. Like the courts the commission passes upon one case and it requires time and constant vigilance to meet the demands of shippers for a hearing regarding their grievances. In the past railroad companies have not moved faster than public opinion forced them to in the matter of changes of rates or conditions of moving traffic. While the suggestions of Mr. Acworth have great value they are only a half statement of the difficulty. First there is lack of facts to base a decision upon. Second, there is lacking a willingness to accept an interpretation that applies to rates

especially unless backed by authority. In large matters of improvements the railroads have shown a generous inclination to meet new demands, but in the personal questions of the individual shippers, who in the aggregate constitute a large body, there is a tendency to ignore his requests. It is at this point in the problem that the commissions with their experts enter.

Sec. 136. Regulation versus Ownership

In America the feeling is that the problem can be worked out through the medium of regulation rather than government ownership. While tried in other countries the ownership of railways in America entails such vast sums and such elaborate organization that it is almost inconceivable, when it is remembered that the receipts of the Pennsylvania Railroad alone are more than half those of the Prussian State roads. The position of those advocating such a remarkable change is largely personal. Some taxpayers declare their taxes would be less if the railroad surplus were used to meet public expenses; shippers, too, thought that nationalization would relieve them of their special disadvantages; and railway workers feel that their position would be greatly improved if they had the State for their employer. In each of these instances, while government ownership has modified the situation, it has brought a new crop of problems found in hard and fast rates, declining efficiency because improvements are held back in order to maintain or increase the surplus and the

development of a large political factor in the management of the roads because of the political power of employes. In other words the railway system of the country "would operate like a government instead of a commercial enterprise" which is, to say the least, of doubtful advantage. Where tried government ownership has developed excessive centralization, leading to an abnormal amount of red tape, large staffs, and a lack of initiative and a a sense of responsibility among the men at the heads of departments.*

However, the fact remains that some public control is necessary and the right to such control having been maintained by the courts, the real problem centers about the query what is a reasonable rate. It may be said as fundamental that the public is entitled to a fair share of the results of earnings (through charging of rates) made by the railroads since they are important contributors to railroad development. Arbitrary rate control by a commission has practically been given over, but doubt as to the double functions of the commission both as an executive body and a court has led to the suggestion that a court be created to try cases of disputes arising from the decisions of the commission. This appears to be the next step in regulation while seeming to bear out the statement of government ownership advocates, that regulation means the piling up of administrative machinery as elaborate as ownership itself, nevertheless the railroads are still under the management of experts and ready to meet the demands of changing commercial conditions. In

* Pratt, E. A. State Railways, London, 1907, p. 4.

America we are entering upon an epoch of railroad control and rate determination whose conclusion ought to take the country far toward the adjustment of the problem, since settlement complete and final is impossible in a country where conditions are constantly changing.

The passage of the Transportation Act, 1920, marked a great forward step in the regulation of American railroads, and the first year of its operation proved the wisdom of many of its provisions. The extension of the powers of the Interstate Commerce Commission, as noted in the last chapter, gave rise to disputes with the state commissions as to the power to fix intrastate rates and fares; and these disputes are now (1921) in process of adjudication. Railroad wages were adjusted equitably in July, 1920, by the United States Railroad Labor Board, established under the Transportation Act with headquarters in Chicago as a permanent tribunal for the adjustment of labor difficulties arising between the carriers and their employes, and operating with marked success during the first year of its existence. The Interstate Commerce Commission, enlarged to a membership of eleven, began to function under its added responsibilities with due regard to the best interests of carriers, shippers and the public; and with the incoming of a new President and Congress in March, 1921, and a more favorable state of public opinion toward the transportation companies, it was generally felt that a new era of railroad development and prosperity in the United States has been auspiciously opened.

PART V
REFERENCES, QUESTIONS AND INDEX

REFERENCES

INTRODUCTION

Cleveland, F. A.—Powell, F. W.: Railroad Promotion and Capitalization in the United States. Longmans, New York, 1909. Chapter V.

Cooley, C. H.: The Theory of Transportation. Amer. Econ. Association Publications, Vol. IX, 1894.

Meyer, B. H.: Railway Legislation in the United States. Macmillan, New York, 1903. Chapter I.

McPherson, L. G.: The Working of the Railroads. New York, 1906. Chapter I.

Goode, T. Paul: Report of the Chicago Harbor Commission, 1909.

PART I

The Growth of Railroads Since 1825

CHAPTER I

THE EARLY PERIOD OF RAILWAY BUILDING

Bogart, E. L.: Economic History of the United States. Longmans, New York, 1907. Chapter XIV.

Carter, C. F.: When Railroads Were New. Holt, New York, 1909.

Cleveland, F. A.—Powell, F. W., as cited. Chapters III and IV.

Hadley, A. T.: Railway Transportation. Putnams, New York, 1885.

Haney, L. H.: Congressional History of Railways Down to 1850. Madison, Wis., 1908.

Larrabee, William: The Railroad Question. Schulte, Chicago, 1898.

Poor, H. V.: Manual. New York, volume for 1881.

Tenth Census of United States, Vol. IV, 1880.

CHAPTER II

THE MIDDLE PERIOD OF RAILROAD HISTORY

Adams, C. F.: Railroads; Their Origin and Problems. Putnam, New York, 1888.

Callender, G. S.: Early Transportation and Banking Enterprises. Quarterly Journal of Economics, November, 1902, Vol. XVII, pp. 111-162.

Dixon, F. H.: State Railroad Control, New York, 1896.

Hadley, A. T.: Railway Transportation. Putnams, New York, 1885.

Larrabee, William: The Railroad Question. Chicago, 1898.

Ringwalt, J. L.: Development of Transportation Systems in the United States. Philadelphia, 1888.

Sanborn, J. B.: Congressional Grants of Land in Aid of Railways. Madison, Wis., 1899.

CHAPTER III

THE PERIOD OF CONSOLIDATION

Bogart, E. L.: Economic History of the United States, as cited, Chapters XXIII-XXIV.

Meyer, B. H.: Railway Legislation in the United States. Macmillan, 1903.

Johnson, E. R.: American Railway Transportation. Chapters V, XV-XVIII.

Spearman, F. H.: The Strategy of Great Railways. New York, 1904.

PART II

Organization and Financing

CHAPTER I

INCORPORATION AND CAPITALIZATION

Cleveland, F. A.—Powell, F. W., as cited. Chapters VII, VIII, IX, X and XI.

Meade, E. S.: Trust Finance. Appleton, New York, 1903.

Greene, T. L.: Corporation Finance. Putnam, New York, 1897.

Wellington, A. M.: Economic Theory of the Location of Railways. New York, 1906. Chapter II.

Webb, W. L.: Economics of Railroad Construction. New York, 1906. Chapters II, III.

CHAPTER II

FORMS AND AGENCIES OF CAPITALIZATION

Cleveland, F. A.—Powell, F. W., as cited. Chapter XVII.

Cleveland, F. A.: Funds and Their Uses. Appleton, New York, 1903.

Hoff, Wilhelm, and Schwabach, Felix: North American Railroads, Their Administration and Economic Policy; Official German Report on American Railroads, Chapter X. New York, 1906.

McPherson, L. G.: The Working of the Railroads. New York, 1906. Chapter V.

CHAPTER III

METHODS OF CONSOLIDATION

Interstate Commerce Commission, 1909, Inter-corporate Relations of the Railways of the United States. Special Report No. 1.

Dixon, F. H.: Railroads in Their Corporate Relations. Political Science Quarterly, November, 1908.

McPherson, L. G., as cited. Chapter VI.

Meyer, B. H.: A History of the Northern Securities Case. Madison, Wis., 1906.

PART III

The Operation of Railways

CHAPTER I

GENERAL ADMINISTRATION

Byers, M. L.: The Economics of Railway Operations. New York, 1907. Part I.

Dewsnup, E. R. (Ed.): Railway Organization and Working. Chicago University Press, 1906. Pp. 1, 141.

Hoff, Wilhelm, and Schwabach, Felix: Official German Report of American Railroads. New York, 1906. Chapters III, IV, V.

Webb, W. L.: The Economics of Railroad Construction. New York, 1906. Chapter VI.

CHAPTER II

MAINTENANCE OF WAY

Wellington, A. M.: Economic Theory of Railway Location, as cited.

Byers, M. L.: Economics of Railway Operation, as cited. Part V, Chapter II.

Bout, H. G.: Railroad Construction and Equipment. Vol. II of "The United States of America"; edited by N. S. Shaler.

Hadley, E. S.: Railway Working and Appliances. London, 1909.

Webb, W. L.: As cited. Chapters IX, XIII, XIV, XV, XVI.

CHAPTER III

MOTIVE POWER AND ROLLING STOCK

Byers, M. L.: Economics of Railway Operation, as cited. Part V, Chapter III.

Dewsnup, E. R. (Ed): Railway Organization and Workings, as cited. Pp. 212, 226.

Webb, W. L.: The Economics of Railroad Construction. New York, 1906. Chapters VII, VIII, X.

Wellington, A. M.: Economics of Railway Location, as cited. Part III.

CHAPTER IV

THE FREIGHT SERVICE

Armour, J. O.: Private Car Lines. Altemus, Philadelphia, 1906.

Dewsnup, E. R. (Ed), as cited. Pp. 63, 76, 80, 99, 113, 335.

Hoff, Wilhelm, and Schwabach, Felix, as cited. Chapter VIII.

Johnson, E. R.: American Railway Transportation. New York, 1903. Chapter IX.

McPherson, L. G., as cited. Chapter III.

CHAPTER V

PASSENGER, EXPRESS AND MAIL SERVICE

Dewsnup, E. R. (Ed), as cited. Pp. 9, 37.

Hoff, Wilhelm, and Schwabach, Felix, as cited. Chapter VII.

Johnson, E R., as cited. 1903.

Express Business in the U. S., Special Rept. Dept. of Commerce and Labor, 1908.

CHAPTER VI

ACCOUNTING AND STATISTICS

Woodlock, T. F.: Anatomy of a Railway Report. New York, 1901.
Eaton, J. S.: Railroad Operations; How to Know Them from a Study of the Accounts and Statistics. New York, 1900.
Dewsnup, E. R. (Ed), as cited. P. 36.
Johnson, E. R.: American Railway Transportation. New York, 1903. Chapter XIV.

CHAPTER VII

PUBLICITY

Dewsnup, E. R. (Ed), as cited. Pp. 23, 44.
Hoff, W.—Schwabach, F., as cited. Chapter VI.
Report of Industrial Commission, 1900, Vol. XIX, pp. 599-610.

PART IV

The Relation of the Railway to the Public

CHAPTER I

THE RATE QUESTION

Acworth, W. M.: The Railways and the Traders. London, 1906.
Dewsnup, E. R. (Ed), as cited. P. 127.
McPherson, L. G.: Railroad Freight Rates. Holt, New York, 1909.
Ripley, W. Z. (Ed): Railway Problems. Ginn, Boston, 1907.

CHAPTER II

STATE AND FEDERAL REGULATION

Meyer, H. R.: Government Regulation of Railway Rates in Great Britain. New York, 1906.
Report of the Industrial Commission, 1900; Vol. XIX.
Transportation Act, 1920.
Merritt, A. N. Federal Regulation of Railway Rates. Boston, 1907.

GOVERNMENT OWNERSHIP

Clark, V. S.: Australian Economic Problems: The Railways. Quarterly Journal of Economics, May, 1908.
Johnson, E. R., as cited. Chapters XXIII, XXIV.
LeRossignol, J. E.: Railways in New Zealand. Quarterly Journal of Economics, August, 1909.
McVey, Frank L.: Modern Industrialism. Appleton, New York, 1904. Part III, Chapter IV.
Pratt, E. A. State Railways. London, 1907.

CHAPTER III

CONCLUSION

Seligman, E. R. A.: Principles of Economics. Longmans, New York, 1905. Chapter XXXI.
Ripley, W. Z. (Ed), as cited. Introduction.
Merritt, A. N. Federal Regulation of Railroad Rates. Boston, 1907.

HISTORIES OF CERTAIN AMERICAN RAILROADS

Billings, Frederick: The Northern Pacific Railroad Company: Its History and Equitable Rights. Address to the Committee on Pacific Railroads, House of Representatives, 1880. 19 pp.

Brownson, H. G.: History of the Illinois Central Railroad.

Cary, J. W.: The Organization and History of the Chicago, Milwaukee and St. Paul Railway Company. Milwaukee, 1892. 392 pp.

Chapman, W. W.: The Northern Pacific Railroad: Its Different Phases from 1864 to 1880. Washington, 1880. 15 pp.

Chesapeake and Ohio Railroad Company: The History of the Chesapeake and Ohio Railroad Company. Richmond, 1868. 49 pp.

Cruise, P.: The Baltimore and Ohio Railroad. Anon. North American Review. Boston, 1829. Vol. XXVIII, pp. 166-86.

Davis, J. P.: The Union Pacific Railway: A Study in Railway Politics, History and Economics. Chicago, 1894. 247 pp.

Flint, H. M.: The Railroads of the United States: Their History and Statistics. Philadelphia, 1868. 452 pp.

Graham, R. S.: The Central Pacific Railroad Company: Facts Regarding Its Past and Present Management. San Francisco, 1889. 40 pp.

Illinois Central Railroad Company: 1851-1901, the Illinois Central Railroad Company, Fiftieth Anniversary. Chicago, 1901.

Livingston, John: The Erie Railway; Its History and Management From 1832 to 1875. New York, 1875. 82-36 pp.

Lord, Eleazar: Historical Review of the New York and Erie Railroad. New York, 1855. 223 pp.

Pennsylvania Company: The Corporate History of the Pittsburgh, Fort Wayne and Chicago Railway Company. Pittsburgh, 1875. 485 pp.

Sipes, W. B.: The Pennsylvania Railroad: Its Origin, Con-

struction, Condition and Connections. Philadelphia, 1875. 281 pp.

Smalley, E. V.: History of the Northern Pacific Railroad. New York, 1883. 437 pp.

Walker, H. T.: Early History of the Delaware, Lackawanna and Western Railroad. Railroad Gazette, New York, 1902. Vol. 34, 388-588 passim.

White, H. K.: History of the Union Pacific Railway. Chicago, 1895. 129 pp.

Wilson, W. B.: History of the Pennsylvania Railroad Company. Philadelphia, 1899. 2 vols.

AMERICAN PERIODICALS ON RAILROADS

American Engineer and Railroad Journal. Monthly. New York, 1832.

American Railway Engineering and Maintenance of Way Association:

Bulletin. Monthly. 1899.

Proceedings. Annual. 1900.

Commercial and Financial Chronicle. Weekly. New York, 1865.

Railroad Gazette. Weekly. New York, 1856.

Railway Age. Weekly. Chicago, 1876.

Railway and Engineering Review. Weekly. Chicago, 1868.

Railway Conductor, The. Monthly. 1884.

Railway World, The. Weekly. Philadelphia, 1857.

Railway Review. Weekly. Chicago, 1868.

QUIZ QUESTIONS

INTRODUCTION

Pages 11-26

1. What part has the frontier played in American history?
2. What are the effects of transportation on the development of commerce?
3. How does a break in transportation develop cities?
4. Show the difference in the development of the railroad in the United States and in Europe.
5. How have natural resources contributed to the development of railways in the United States?
6. In what way has the rivalry of trade centers contributed to the growth of railroads?
7. Give the four causes for the development of transportation in the United States.
8. Enumerate some of the statistics showing the development of the railroad.
9. What are the results brought about by the railroads?
10. How does railway transportation differ from other forms of business?
11. What is a railway?

PART I

The Growth of Railroads Since 1825

CHAPTER I

THE EARLY PERIOD OF RAILROAD BUILDING

Pages 29-41

1. What are the periods in the history of American railroads?
2. What part has the canal played in the development of transportation in America?
3. What checked the development of canals in 1837, and why?
4. Discuss the early history of railway building.
5. Trace the evolution of the rail.
6. Why were short line roads first constructed?
7. Describe the early history of the Pennsylvania Railroad.
8. Summarize the railroad building of the first period.
9. Show the attitude of the public toward railroad construction.

CHAPTER II

THE MIDDLE PERIOD OF RAILROAD HISTORY.

Pages 43-55

1. What two significant events mark the beginning and end of the second period?

2. Describe the competition of the railroad with the canal.
3. Why was there so little legislative control?
4. How did the land grant policy affect the growth of railroads?
5. Give the reason for the rate wars of the decade 1870.
6. What was the origin of the Grange societies and the so-called Granger legislation.
7. Trace the attempts at federal legislation regulating railroad rates.
8. Give the names and dates of establishment of the transcontinental lines.

CHAPTER III

THE PERIOD OF CONSOLIDATION

Pages 57-72

1. What were the economic conditions at the opening of the third period?
2. Why were railroad rates reduced?
3. What were the main features of the interstate commerce act of 1887?
4. How was the act modified by court decisions?
5. What were the features of the Elkins bill of 1903?
6. Describe the movement toward consolidation of railways.
7. What is the basis of the consolidation? Why?
8. Summarize the characteristics of the period.

PART II

Organization and Financiering

CHAPTER I

INCORPORATION AND CAPITALIZATION

Pages 75-88

1. Give figures showing the vastness of the railway interests.
2. What is a corporation?
3. What advantages does a corporation have over a partnership as a form of organization?
4. What are the three groups of corporation laws?
5. What is a corporate charter?
6. Describe the function of a promoter.
7. Give some examples of the pay of promoters.
8. What is the difference between a speculator and an investor?
9. What is a survey?
10. Discuss three theories of capitalization.
11. What is the present attitude toward corporate organizations?

CHAPTER II

FORMS AND AGENCIES OF CAPITALIZATION

Pages 89-101

1. What is the difference between a stock and a bond?

2. Define the different forms of stock shares.
3. Upon what does the value of a bond depend?
4. Enumerate and describe the different kinds of railroad bonds.
5. What function does a trust company perform in financing a railroad enterprise?
6. What part does an underwriter play in selling bonds?
7. What is a receiver's certificate?
8. Why is a railroad in the hands of a receiver a dangerous competitor?

CHAPTER III

METHODS OF CONSOLIDATION

Pages 103-121

1. What explanation can be given of the consolidation of railroads?
2. How can control of a railroad property be secured?
3. Describe and give instances of control by lease.
4. What is a holding company?
5. What are the great railroad systems of the United States, what railroads constitute them?
6. To what extent has consolidation of railroads been carried in the United States?

PART III

The Operation of Railways

CHAPTER 1

GENERAL ADMINISTRATION

Pages 125-148

1. What is the difference between the three types of organization spoken of in the text?
2. What are the three methods of apporting the work of departments?
3. Describe the division of work in a railroad organization?
4. What danger is there in the centralization of authority?
5. Indicate the differences in the organization of the Chicago and Alton, Erie, Illinois Central and the Pennsylvania.
6. Describe the organization of a railroad division.
7. What is the method of handling freight trains?
8. How many men are employed by the railways of the country?
9. Discuss the policy of purchasing or manufacturing supplies.
10. What are the requirements for admission to the railroad service?
11. What provisions have been made for the education and training of railway employees?
12. What methods have been adopted by the railroads to encourage interest and length of service?

CHAPTER II

MAINTENANCE OF WAY

Pages 149-180

1. What is the present policy regarding railroad grades and right of way?
2. What change has taken place in train mileage and ton miles in railway operation?
3. What have grades to do with railway operation? Discuss fully.
4. Contrast the Erie and Pennsylvania in the matter of construction policy.
5. What are the three classes of railroad construction? Discuss fully.
6. Enumerate and discuss the items in construction cost.
7. Describe "permanent way."
8. Why is ballast used in railway construction?
9. How are ties used? What are the disadvantages of the steel tie?
10. Describe the T rail?
11. What are the two different types of railroad signals and how do they differ?
12. Describe the block signal system.
13. What are the three methods of telegraph dispatching?
14. Describe the organization of a department of maintenance of way as recommended by the American Railway Engineering and Maintenance of Way Association.

CHAPTER III

MOTIVE POWER AND ROLLING STOCK

Pages 181-214

1. What is a locomotive?
2. What is the principle of the compound cylinder?
3. What advantages are there in the use of the compound locomotive?
4. Describe the different types of locomotives.
5. Describe the newer type of electric locomotive.
6. How does the Forney type differ from the locomotive generally used?
7. What determines the tonnage a locomotive can move?
8. What is meant by rating locomotives?
9. How does a grade affect the rating of a locomotive?
10. Can momentum be counted as a factor in determining rating? Give reasons for answer.
11. Should rating be determined by number of cars or by weight? Why?
12. What indirect savings have resulted from the use of tonnage ratings in operation?
13. What are the four tests of coal as a fuel?
14. What has been done to solve the question of water for locomotive purposes?
15. How do the expenses of repairing locomotives vary and why?
16. What is meant by pooling engines?
17. Describe the newer passenger cars and safety devices now used.

CHAPTER IV

THE FREIGHT SERVICE

Pages 215-234

1. What is the relation of passenger and freight earnings?
2. Present the argument for the use of large cars for the freight service.
3. How is freight classified and why?
4. Describe the method of moving freight.
5. What is the manifest system?
6. Why should freight trains be run as extras rather than on regular schedule?
7. What has been the reason for the development of fast freight lines.
8. What is the method of operating refrigerator cars.
9. What are the reasons for the decline of freight car performance?
10. What is a freight clearing house?
11. Describe a freight terminal.
12. What is objectionable as a matter of policy to the leasing of terminals?

CHAPTER V

Passenger, Express and Mail Service

1. What is the extent of the passenger business carried by railroads?

2. In what respects does the business differ from the freight traffic?
3. Enumerate the bureaus in a passenger department.
4. What are the different kinds of passenger traffic?
5. Name and define the different kinds of tickets.
6. How are ticket sales audited?
7. Compare the methods of handling baggage with those used in Europe.
8. On what basis are the mails carried and paid for?
9. What are the general terms of contracts made between express companies and railroad companies?
10. On what basis do the railways pay for the Pullman service?
11. What is the difference between the old and late methods of heating and lighting trains? Discuss in some detail.
12. Is there any economic basis for fast trains? How do they increase traffic?
13. How does the competition of trolley lines affect the railroad passenger business?
14. What are the essential features of a passenger terminal?

CHAPTER VI

Accounting and Statistics

1. What is the purpose of an accounting system and why are statistics essential to the management of a railroad?
2. What is essential to know in railroad operation?

3. What should the investor know regarding the railroad he is interested in?
4. What should a railroad report cover?
5. Define income account.
6. What is a balance sheet?
7. What is the right principle regarding charges to capital account?
8. What should a railroad report show from the point of view of the investor?
9. What is a ton mile?
10. Define the term train mile.
11. How are the two units ton mile and train mile applied to a railroad report?
12. What are the four classes of operating expenses?
13. What is meant by prorating of costs?
14. How far can ton mile costs be used to determine rates?

CHAPTER VII

Publicity

1. What is publicity?
2. What are the advertising methods used by the passenger departments?
3. Describe the work of the industrial commissioner.
4. How are town sites located?
5. Is there a system of railroad taxation in the United States? Give reasons for answer.
6. What are the three stages through which the taxation of railroads has passed?
7. How successful has been the valuation of railroad properties by tax commissions?

8. Describe the gross earnings tax.
9. To what extent does the taxation of railroads vary?
10. What changes have taken place in the relation of railroads to employees?

PART IV

The Relation of the Railroad to the Public

CHAPTER I

THE RATE QUESTION.

Pages 297-316

1. What is the difference between the view of a railroad regarded privately and as a social agent?
2. What is meant by the law of increasing returns and how does it apply to a railroad?
3. What is the relation of expense of operation to traffic carried?
4. What are some of the bases upon which a fair return may be allowed upon the valuation of a railroad? Are these satisfactory? Give reasons for answer.
5. What are the limits between which rates can be determined?
6. Name some of the theories of rates.
7. What is the cost theory?
8. What is the postal service theory of rates?
9. Discuss the value of service theory.
10. What is the taxation theory of rates?
11. What is the basis of the "what the traffic will bear" theory of rates?

12. What is meant by classification of freight?
13. What is a tariff?
14. What is meant by a basic rate?
15. How does water competition affect the determination of rates?
16. What is meant by common point territory?
17. What is meant by discrimination?
18. What is the difference between freight and passenger rates?
19. What is meant by an equitable rate?
20. What is the attitude of the courts regarding the basis of rates?

CHAPTER II

STATE AND FEDERAL REGULATION

Pages 317-354

1. What is the meaning of the term regulation?
2. What are the different types of regulation followed in United States and Europe?
3. What are the arguments in favor of private management and direction?
4. Describe the development of regulation of railways in England.
5. What has been the course of regulation in the United States?
6. In what way was the Interstate Commerce Commission Act supplemented by the Anti-Trust Act of 1890?
7. Give the main features of the Hepburn Act.
8. What are the main features of the Transportation Act?

9. In what way is the Commission limited?
10. What bearing has the Minnesota case on the determination of rates by legislation?
11. In what respect are the interests of shippers and railroads the same?

CHAPTER III

CONCLUSION.

Pages 355-369

1. Summarize the part played by the railway in the development of the economic history of America.
2. In what sense has this history been one of adjustment?
3. Why is executive regulation of railroads likely to supersede legislative and judicial regulation?
4. What is the difference between the attitude of the French and the English in the matter of executive regulation?
5. Why have the Prussian Councils and the Massachusetts Commission been successful in dealing with the regulation of railroads?
6. What part has public opinion played in the regulation of railroads in the United States?
7. Have the railways met the public in this matter? Give reasons for answer.
8. Upon what fundamentals must a solution of the railroad regulation question be based?

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